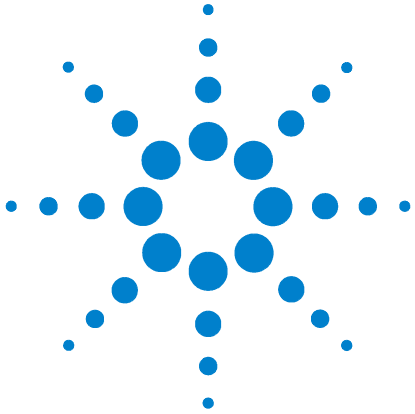

Agilent N8201A Performance Downconverter Synthetic Instrument Module, 3 Hz to 26.5 GHz

User's and SCPI Programming Guide

Edition, January 15, 2008

N8201-90014

Agilent Technologies

Notices

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Introducing the N8201A Performance Downconverter

The Agilent Technologies N8201A performance downconverter down converts a microwave signal to an IF signal providing IF output frequencies of 7.5, 21.4, and 321.4 MHz to offer three different signal bandwidth capabilities. External mixing can be utilized to down convert microwave signals up to 110 GHz. The N8201A is based upon the industry's most accurate spectrum analyzer, the PSA Series.

Agilent's synthetic instrument family offers the highest-performing RF/MW LAN-based modular instrumentation and the smallest footprint for automated test systems; providing the maximum flexibility and minimizing the cost of an ATS over its lifetime.

Agilent's synthetic instrument modules use LAN eXtension for Instrumentation (LXI) modular format. LXI differs from other modular formats (such as VXI and PXI) by using an external computer and local area network (LAN), rather than embedded computers, for control.

The LXI standard supports the IEEE 1588 time synchronization and protocol standard, which allows synchronous triggering of different instruments, even with different-length LAN cables. The IEEE 1588 precision time protocol (PTP) enables a common sense of time over a distributed system.

Synthetic instrument modules offered by Agilent Technologies include the following:

- N8201A performance downconverter, 3 Hz to 26.5 GHz
- N8211A performance analog upconverter, 250 kHz to 20 / 40 GHz
- N8212A performance vector upconverter, 250 kHz to 20 GHz
- N8221A IF digitizer, 30 MS/s
- N8241A arbitrary waveform generator, 15-Bit, 1.25 GS/s or 625 MS/s
- N8242A arbitrary waveform generator, 10-Bit, 1.25 GS/s or 625 MS/s

For further information, refer to:

http://www.agilent.com/find/synthetic

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:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer <param> “Span Pair" on page 209

:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer? “Span Pair" on page 209

:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN <param> “Span Pair" on page 209

:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN? “Span Pair" on page 209

:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt <integer> “Delta Pair" on page 207

:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt? “Delta Pair" on page 207

:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP <integer> “Delta Pair" on page 207

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[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1 “Res BW" on page 92

[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO? “Res BW" on page 92

[:SENSe]:BANDwidth|BWIDth[:RESolution]? “Res BW" on page 92

[:SENSe]:CORRection:CSET:ALL:DELete “Delete All Corrections" on page 69

[:SENSe]:CORRection:CSET:ALL[:STATe] OFF|ON|0|1 “Corrections" on page 64

[:SENSe]:CORRection:CSET:ALL[:STATe]? “Corrections" on page 64

[:SENSe]:CORRection:CSET[1]|2|3|4:DATA <freq>,<rel_ampl>{,<freq>,<rel_ampl>}

[:SENSe]:CORRection:CSET[1]|2|3|4:DATA:MERGe <freq>,<rel_ampl>{,<freq>,<rel_ampl>}

[:SENSe]:CORRection:CSET[1]|2|3|4:DATA? “Edit" on page 66

[:SENSe]:CORRection:CSET[1]|2|3|4:DELete “Delete Corrections" on page 68

[:SENSe]:CORRection:CSET[1]|2|3|4:X:SPACing LINear|LOGarithmic “Freq Interp" on page 68

[:SENSe]:CORRection:CSET[1]|2|3|4[:STATe] OFF|ON|0|1 “Apply Corrections" on page 64

[:SENSe]:CORRection:CSET[1]|2|3|4[:STATe]? “Apply Corrections" on page 64

[:SENSe]:CORRection:OFFSet[:MAGNitude] <relative_power> “Ext Amp Gain" on page 70

[:SENSe]:CORRection:OFFSet[:MAGNitude]? “Ext Amp Gain" on page 70

[:SENSe]:DETector:AUTO OFF|ON|0|1 “Auto" on page 106

[:SENSe]:DETector:AUTO? “Auto" on page 106

[:SENSe]:DETector[:FUNCtion] NORMal|AVERage|POSitive|SAMPle|NEGative|QPEak |EAVerage|EPOSitive|MPOSitiv|RMS “Detector Auto Manual" on page 106

[:SENSe]:DETector[:FUNCtion]? “Detector Auto Manual" on page 106

[:SENSe]:FEED RF|AREFerence “Input Port" on page 184

[:SENSe]:FEED? “Input Port" on page 184

[:SENSe]:FREQuency:CENTer <frequency>|UP|DOWN “Center Freq" on page 176

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1 “CF Step" on page 178

[:SENSe]:FREQuency:CENTer:STEP:AUTO? “CF Step" on page 178

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq> “CF Step" on page 178

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]? “CF Step" on page 178

[:SENSe]:FREQuency:CENTer? “Center Freq" on page 176

[:SENSe]:FREQuency:OFFSet <freq> “Freq Offset" on page 180

[:SENSe]:FREQuency:OFFSet? “Freq Offset" on page 180

[:SENSe]:FREQuency:SPAN <freq> “Span" on page 454

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio <value> “Span/RBW" on page 104

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO OFF|ON|0|1 “Span/RBW" on page 104

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO? “Span/RBW" on page 104

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio? “Span/RBW" on page 104

[:SENSe]:FREQuency:SPAN:FULL “Span Zoom" on page 455

[:SENSe]:FREQuency:SPAN:PREVious “Last Span" on page 458

[:SENSe]:FREQuency:SPAN? “Span" on page 454

[:SENSe]:FREQuency:STARt <freq> “Start Freq" on page 177

[:SENSe]:FREQuency:STARt? “Start Freq" on page 177

[:SENSe]:FREQuency:STOP <frequency> “Stop Freq" on page 178

[:SENSe]:FREQuency:STOP? “Stop Freq" on page 178

[:SENSe]:FREQuency:SYNThesis 1|2|3 “PhNoise Opt" on page 81

[:SENSe]:FREQuency:SYNThesis:AUTO OFF|ON|0|1 “PhNoise Opt" on page 81

[:SENSe]:FREQuency:SYNThesis:AUTO? “PhNoise Opt" on page 81

[:SENSe]:FREQuency:SYNThesis? “PhNoise Opt" on page 81

[:SENSe]:MARKer[1]|2|3|4:X:POSition <param> “Marker Units" on page 203

[:SENSe]:MARKer[1]|2|3|4:X:POSition? “Marker Units" on page 203

[:SENSe]:MIXer:BAND K|A|Q|U|V|E|W|F|D|G|Y|J|USER “Input Mixer (Option AYZ only)" on page 186

[:SENSe]:MIXer:BAND? “Input Mixer (Option AYZ only)" on page 186

1

[:SENSE]:MIXer:BIAS <number> “Mixer Bias" on page 194

[:SENSE]:MIXer:BIAS:STATe OFF|ON|0|1 “Mixer Bias" on page 194

[:SENSE]:MIXer:BIAS:STATe? “Mixer Bias" on page 194

[:SENSE]:MIXer:BIAS? “Mixer Bias" on page 194

[:SENSe]:MIXer:HARMonic <integer> “Harmonic" on page 193

[:SENSe]:MIXer:HARMonic:AUTO OFF|ON|0|1 or <boolean> “Harmonic" on page 193

[:SENSe]:MIXer:HARMonic:AUTO? “Harmonic" on page 193

[:SENSe]:MIXer:HARMonic? “Harmonic" on page 193

[:SENSe]:POWer[:RF]:ATTenuation <rel_power> “Attenuation" on page 47

[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1 “Attenuation" on page 47

[:SENSe]:POWer[:RF]:ATTenuation:AUTO? “Attenuation" on page 47

[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] <integer> “Atten Step" on page 71

[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]? “Atten Step" on page 71

[:SENSe]:POWer[:RF]:ATTenuation? “Attenuation" on page 47

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1 “Int Preamp (Options 1DS and 110 only)" on page 63

[:SENSe]:POWer[:RF]:GAIN[:STATe]? “Int Preamp (Options 1DS and 110 only)" on page 63

[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <power> “Max Mixer Lvl" on page 72

[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]? “Max Mixer Lvl" on page 72

[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe] ON|OFF|0|1 “Microwave Preselector (Option 123 Only)" on page 197

[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe] ON|OFF|0|1 “Microwave Preselector (Option 123 Only)" on page 197

[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe]? “Microwave Preselector (Option 123 Only)" on page 197

[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe]? “Microwave Preselector (Option 123 Only)" on page 197

[:SENSe]:POWer[:RF]:PADJust <freq> “Presel Adjust" on page 53

[:SENSe]:POWer[:RF]:PADJust:PRESelector MWAVe|MMWave|EXTernal “Presel Adjust" on page 53

[:SENSe]:POWer[:RF]:PADJust:PRESelector? “Presel Adjust" on page 53

[:SENSe]:POWer[:RF]:PADJust? “Presel Adjust" on page 53

[:SENSe]:POWer[:RF]:PCENter “Presel Center" on page 51

[:SENSe]:ROSCillator:EXTernal:FREQuency <value> “Freq Ref" on page 492

[:SENSe]:ROSCillator:EXTernal:FREQuency? “Freq Ref" on page 492

[:SENSe]:ROSCillator:OUTPut[:STATe] OFF|ON|0|1 “10 MHz Out" on page 493

[:SENSe]:ROSCillator:OUTPut[:STATe]? “10 MHz Out" on page 493

[:SENSe]:ROSCillator:SOURce INTernal|EXTernal “Freq Ref" on page 492

[:SENSe]:ROSCillator:SOURce? “Freq Ref" on page 492

[:SENSe]:SIDentify:[STATe]? “Signal ID (Option AYZ only)" on page 191

[:SENSe]:SIDentify:MODE ISUPpress|ISHift “Signal ID Mode" on page 192

[:SENSe]:SIDentify:MODE? “Signal ID Mode" on page 192

[:SENSe]:SIDentify[:STATe] OFF|ON|0|1 “Signal ID (Option AYZ only)" on page 191

[:SENSe]:SWEep:EGATe:DELay <time> “Gate" on page 465

[:SENSe]:SWEep:EGATe:DELay? “Gate" on page 465

[:SENSe]:SWEep:EGATe:EXTernal[1]:LEVel <voltage> “Gate Source" on page 469

[:SENSe]:SWEep:EGATe:EXTernal[1]:LEVel? “Gate Source" on page 469

[:SENSe]:SWEep:EGATe:EXTernal2:LEVel <voltage> “Gate Source" on page 469

[:SENSe]:SWEep:EGATe:EXTernal2:LEVel? “Gate Source" on page 469

[:SENSe]:SWEep:EGATe:LENGth <time> “Length" on page 469

[:SENSe]:SWEep:EGATe:LENGth? “Length" on page 469

[:SENSe]:SWEep:EGATe:POLarity NEGative|POSitive “Polarity" on page 468

[:SENSe]:SWEep:EGATe:POLarity NEGative|POSitive? “Polarity" on page 468

[:SENSe]:SWEep:EGATe:SOURce EXTernal[1]|EXTernal2 “Gate Source" on page 469

[:SENSe]:SWEep:EGATe:SOURce? “Gate Source" on page 469

[:SENSe]:SWEep:EGATe:VIEW ON|OFF|1|0 “Gate View" on page 467

[:SENSe]:SWEep:EGATe:VIEW? “Gate View" on page 467

[:SENSe]:SWEep:EGATe[:STATe] OFF|ON|0|1 “Gate" on page 465

[:SENSe]:SWEep:EGATe[:STATe]? “Gate" on page 465

[:SENSe]:SWEep:FFT:SPAN:RATio <integer> “FFTs/Span" on page 79

[:SENSe]:SWEep:FFT:SPAN:RATio? “FFTs/Span" on page 79

[:SENSe]:SWEep:POINts <number of points> “Points" on page 472

[:SENSe]:SWEep:POINts? “Points" on page 472

[:SENSe]:SWEep:TIME <time> “Sweep Time" on page 460

[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1 “Auto Sweep Time" on page 464

[:SENSe]:SWEep:TIME:AUTO:RULes NORMal|ACCuracy “Auto Sweep Time" on page 464

[:SENSe]:SWEep:TIME:AUTO:RULes? “Auto Sweep Time" on page 464

[:SENSe]:SWEep:TIME:AUTO? “Auto Sweep Time" on page 464

[:SENSe]:SWEep:TIME? “Sweep Time" on page 460

[:SENSe]:SWEep:TYPE AUTO|FFT|SWEep “FFT & Sweep" on page 76

[:SENSe]:SWEep:TYPE:AUTO:RULes SPEed|DRANge “Auto: Best Speed" on page 77

[:SENSe]:SWEep:TYPE:AUTO:RULes? “Auto: Best Speed" on page 77

[:SENSe]:SWEep:TYPE? “FFT & Sweep" on page 76

1 Using This Document

This book provides the user and programming information for the core Agilent Technologies N8201A performance downconverter functions.

About the User's and Programmer's Information

Instrument Functions - provides information about the Spectrum Analyzer Virtual Front Panel and lower-level key functions of your N8201A and their associated programming commands. This information is organized alphabetically.

Programming Fundamentals - provides information on SCPI and C programming language basics, and on using LAN.

Using the STATus System - provides information about the instruments internal status monitoring system with information on how to monitor the status using a remote program and descriptions of all the available commands.

Terms Used in This Book

The following terms are used to describe each key. Note that a key description may not use all the terms.

State Saved: Indicates what happens to a particular function when the instrument state is saved (to the internal c:\ drive). It also indicates whether the current settings of the function are maintained if the instrument is powered on or preset using **Power On Last State** or **User Preset**.

Dependencies/Couplings: Describes dependencies or interactions to other functions or settings in the N8201A.

Factory Preset: Describes the function settings after a **Factory Preset**.

Default Terminator: Indicates the units that will be attached to the numerical value that you have entered. This default will be used from the front panel, when you terminate your entry by pressing the **Enter** key, rather then selecting a units key. This default will be used remotely when you send the command without specifying any units after your value(s).

Range: Describes the range of the smallest to largest values to which the function can be set. If you try to set a value below the minimum value, the N8201A defaults to the minimum value. If you try to set a value above the maximum value, the N8201A defaults to the maximum value.

Remote Command: Shows the syntax requirements for each SCPI command.

Example: Provides command examples using the indicated remote command syntax.

2 Amplitude / Y Scale

Activates the Reference Level function and displays the Amplitude menu keys. These functions control how data on the vertical (Y) axis is displayed and corrected, and control instrument settings that affect the vertical axis.

Ref Level

Adjusts the absolute amplitude represented by the top graticule line on the display (the reference level). `Ref` in the upper left corner of the display, indicates the current value. The **Amplitude**, **Y Axis Units** setting determines the Reference Level units.

Key Path: AMPLITUDE / Y Scale

Dependencies/Couplings: If you reduce the Attenuation setting, the N8201A may have to lower the Reference Level to maintain the proper level at the top of the screen. If you then increase Attenuation, the Reference Level does *not* increase to its previous value.

When the input attenuator is auto-coupled, Attenuation (Auto), its setting may be affected by changes in the reference level setting. See "Attenuation" on page 47.

Reference level is affected by: Attenuation, Preamp, Ext Amp Gain, Reference level offset, Max Mixer Level and Y-Axis Units.

State Saved: Saved in Instrument State

Factory Preset: 0 dBm

Range: Determined by the settings of the input attenuator, reference level offset, external amplitude gain, and whether the preamp (Option 1DS or 110) is on or off.

Examples:

– 170 dBm to 30 dBm with zero reference level offset

– 180 dBm to 20 dBm with 10 dB ext amp gain

– 160 dBm to 40 dBm with 10 dB reference level offset

– 170 dBm to 0 dBm with preamp on (Option 1DS or 110)

Remote Command:

```
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:RLEVel <ampl>
```

```
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:RLEVel?
```

Example:

```
DISP:WIND:TRAC:Y:RLEV 20 dbm
```

Sets the reference level to 20 dBm, which displays in the current Y-Axis Units. For example, if the Y-Axis Units are dBµV, then 127 dBµV will be displayed.

Attenuation

Allows you to adjust the input attenuation. Press Atten Step to set the attenuation step so that attenuation will change in 2 dB or 10 dB increments. The N8201A input attenuator reduces the power level of the input signal delivered to the input mixer. If set manually, the attenuator is recoupled when Attenuation (Auto) is selected.

Attenuation is coupled to Reference Level, so adjusting the Reference Level may change the Attenuation. The N8201A selects an Attenuation setting that is as small as possible while keeping the Ref Level at or below the Max Mixer Lvl setting. The current value is indicated by Atten at the top of the display. A # appears in front of Atten when Attenuation (Man) is selected.

CAUTION

To prevent damage to the input mixer, do not exceed a power level of +30 dBm at the input.

To prevent signal compression, keep the power at the input mixer below 0 dBm (10 MHz - 200 MHz), below 3 dBm (200 MHz - 6.6 GHz), and below –2 dBm (6.6 GHz - 50.0 GHz). With the attenuator set to Auto, a signal at or below the reference level results in a mixer level at or below –10 dBm.

Key Path: AMPLITUDE / Y Scale

State Saved: Saved in Instrument State

Factory Preset: Auto Coupled, 10 dB (for external amplifier gain of 0 dB)

Resolution/Rounding/Truncation: The attenuation is resolved to 2 dB increments. If the value is at least 0.5 dB over a value, then the next higher value is selected. Therefore, 10.4 selects 10, while 10.5 selects 12.

Range: 0 dB to 70 dB

Remote Command:

```
[:SENSe]:POWer[:RF]:ATTenuation <rel_power>
[:SENSe]:POWer[:RF]:ATTenuation?
[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1
[:SENSe]:POWer[:RF]:ATTenuation:AUTO?
```

Remote Command Notes:

The Reference Level setting may be affected when the Attenuation is changed. See "Ref Level" on page 46.

Example:

```
POW:ATT 30

POW:ATT?

POW:ATT:AUTO ON

POW:ATT:AUTO?
```

Scale/Div

Sets the units per vertical graticule division on the display. This function is only available when Scale Type (Log) is selected and the vertical scale is power, or Demod View is on and the vertical scale is hertz. When Scale Type (Lin) is selected, Scale/Div is unavailable.

Key Path: AMPLITUDE / Y Scale

State Saved: Saved in Instrument State

Factory Preset: 10 dB, in logarithmic scale type

Fundamental Units: dB; kHz

Terminators: dB; Hz, kHz, MHz, GHz

Default Terminator: dB; kHz

Range: 0.1 dB to 20 dB, 1 kHz to 240 kHz (When Demod View (On) is selected.)

Remote Command:

```
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:PDIVision <power>
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:PDIVision?
```

Example:

```
DISP:WIND:TRAC:Y:PDIV 5 DB
```

Scale Type

Allows you to choose a linear or logarithmic vertical scale for the display and for remote data readout.

The scale type for display and remote data readout may be different from the scale used for averaging processes. For information on the scale used for the averaging process, see "Avg/VBW Type" on page 85.

When Scale Type (Log) is selected, the vertical graticule divisions are scaled in logarithmic units. The top line of the graticule is the Reference Level and uses the scaling per division, Scale/Div to assign values to the other locations on the graticule.

When Scale Type (Lin) is selected, the vertical graticule divisions are linearly scaled with the reference level value at the top of the display and zero volts at the bottom. Each vertical division of the graticule represents one-tenth of the Reference Level.

The Y-axis units used for each type of display are set by pressing **Y Axis Units**. The N8201A remembers the settings for both Log and Lin.

Key Path: AMPLITUDE / Y Scale

State Saved: Saved in Instrument State

Factory Preset: Log

Remote Command:

```
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:SPACing
LINear|LOGarithmic
```

```
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:SPACing?
```

Example:

```
DISP:WIND:TRAC:Y:SPAC LOG
```

```
DISP:WIND:TRAC:Y:SPAC?
```

Presel Center

Adjusts the centering of the preselector filter to optimize the amplitude accuracy at the frequency of the active marker. If no marker is on when Presel Center is pressed, the N8201A turns on the currently selected marker and does a peak search. If a marker is already on, it should be placed on the peak of interest before pressing Presel Center.

The microwave preselector is used for frequencies from 2.85/3.05 GHz (depending on frequency band) to 26.8 GHz. To center the preselector, you must set up and request a Presel Center in a microwave band. (See Presel Adjust below for more details.).

The unpreselected high band Option 123 lets you bypass the preselector path. (See "Microwave Preselector (Option 123 Only)" on page 197.)

When the preselector path is bypassed, the Presel Center and Presel Adjust keys are unavailable (unless you are using external mixing with preselected external mixers).

For proper preselector centering, you should make sure that:

- if the marker is off, the highest peak onscreen is valid for centering and is in the range of an active preselector,

  or

- if the marker is on, the signal at the marker is a peak that allows centering and is in the range of an active preselector.

Other considerations or cautions include:

- If a marker is already on, the N8201A attempts the centering at the current marker position and no peak search is performed. (This allows you to center the preselector for signals which are not the strongest on-screen signals.)
- The preselector path can bypassed. See "Microwave Preselector (Option 123 Only)" on page 197. If it is bypassed, this functionality is not available.
- If the signal at the marker position is unstable the algorithm will not function properly. An example of this would be noise or a noise-like signal like a CDMA digital communications signal.
- There is no preselector for signals below 3.05 GHz (in band 0).
- With Input Mixer (Ext) selected (see page 186) and the Mixer Type set to Presel (see page 194), Presel Center adjusts the frequency of the external preselector filter to maximize the amplitude at the active marker frequency.

Key Path: AMPLITUDE / Y Scale

Dependencies/Couplings: This function is not available (grayed out) if:

- the preselector is off. (See "Microwave Preselector (Option 123 Only)" on page 197.)
- external mixing is selected and Mixer Type is unpreselected. (See page 186 and page 194.)
- the frequency range is entirely within band 0 (0 Hz to ~3.05 GHz).

- the gated sweep function is on (Sweep, Gate On.)

Remote Command:

```
[:SENSe]:POWer[:RF]:PCENter
```

Remote Command Notes:

If this command is sent in a non-preselected band, or if the active marker is less than 3 GHz, an error message is sent.

Example:

```
POW:PCEN
```

Presel Adjust

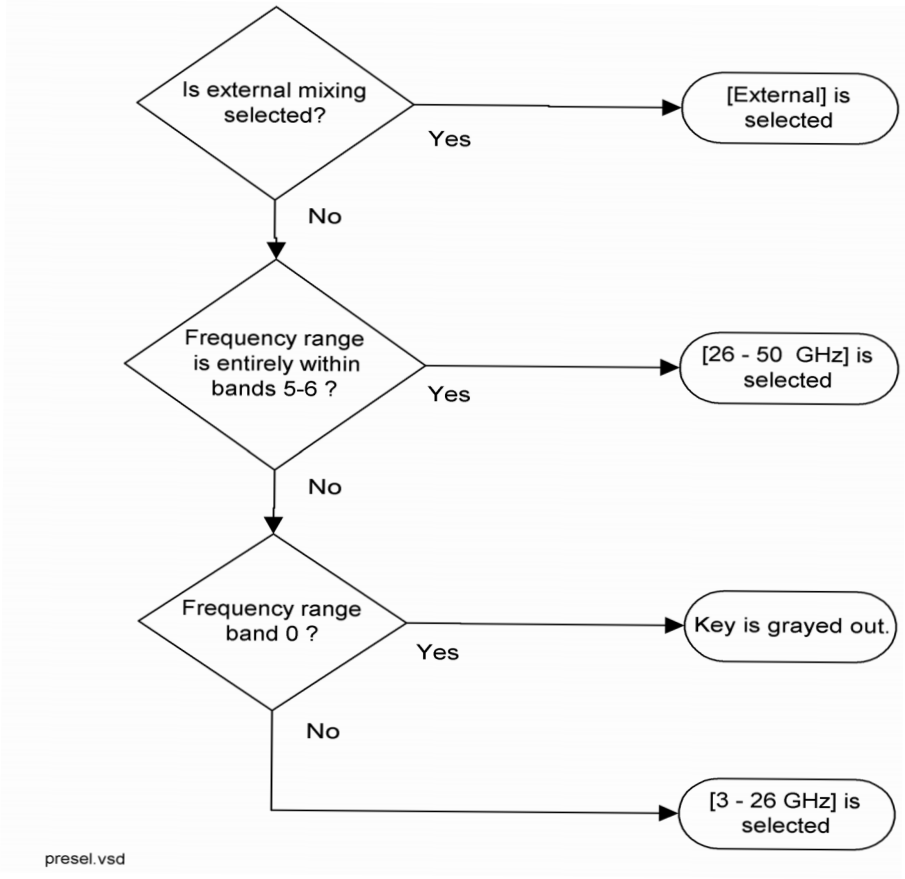
Allows you to manually adjust the preselector filter center frequency to optimize its response on the signal of interest. This function is not available in frequency band 0. It is for signals ≥2.85 GHz in band 1 and higher. It is not available if the preselector is turned off. The key also accesses the menu to choose the desired preselector.

For general purpose signal analysis, using Presel Center is recommended. Centering the filter minimizes the impact of long-term preselector drift. Presel Adjust can be used instead to manually optimize the preselector. One application of manual optimization would be to peak the preselector response, which both optimizes the signal-to-noise ratio and minimizes amplitude variations due to small (short-term) preselector drifting.

The adjustment is preselector specific and the N8201A stores a value for each preselector.

The key readout shows which preselector will be adjusted when the key is pressed. The choices are [3-26 GHz] and [External]. After performing a Presel Center, the value that is shown on the Presel Adjust key is the offset from nominal of the affected preselector's frequency.

With Presel Adjust selected, press the key again to access the preselector selection menu to select the preselector you wish to adjust. Some instrument settings will force a preselector selection. The following flowchart shows the conditions that cause the preselector selection to change:



Key Path: **AMPLITUDE / Y Scale**

Dependencies/Couplings: This function is not available (grayed out) if:

- the preselector is off. (See "Microwave Preselector (Option 123 Only)" on page 197.)
- external mixing is selected and Mixer Type is unpreselected.
- the frequency range is entirely within band 0 (0 Hz to ~3.05 GHz).
- the gated sweep function is on (Sweep, Gate On.)

State Saved: Saved in Instrument State

Factory Preset: 3 - 26 GHz, 0.0 Hz

Range: –500 MHz to 500 MHz

Remote Command:

```
[:SENSe]:POWer[:RF]:PADJust <freq>
[:SENSe]:POWer[:RF]:PADJust?
```

```
[:SENSe]:POWer[:RF]:PADJust:PRESelector
MWAVe|MMWave|EXTernal

[:SENSe]:POWer[:RF]:PADJust:PRESelector?
```

Example:

```
POW:PADJ:PRES EXT

POW:PADJ 100 KHZ
```

3 - 26 GHz

Selects the preselector for the N8201As microwave frequency bands.

Key Path: AMPLITUDE / Y Scale, Presel Adjust

Dependencies/Couplings: This function is not available (grayed out) if:

- the microwave preselector is bypassed (see See "Microwave Preselector (Option 123 Only)" on page 197.) Error 229 is sent.
- external mixing is selected. Error 231 is sent.
- the span is entirely in band 0. Error 208 is sent.
- the span is entirely in bands 5-6. Error 208 is sent.

Remote Command:

See "Presel Adjust" on page 53.

External

Selects the external mixer preselector.

Key Path: AMPLITUDE / Y Scale, Presel Adjust

Dependencies/Couplings: •T

- It is only available for Option 123.
- It is unavailable if external mixing is selected. Error 231 is sent.
- It is unavailable if you are using external mixing and have specified an unpreselected external mixer. Error 230 is sent.

Remote Command:

See "Presel Adjust" on page 53.

Y Axis Units

Displays the menu keys that enable you to change the vertical (Y) axis amplitude units. The N8201A retains the entered Y Axis Units separately for both Log and Lin amplitude scale types. For example, if Scale Type has been set to Log, and you set Y Axis Units to dBm, pressing Scale Type (Log) sets the Y Axis Units to dBm. If Scale Type has been set to Lin and you set Y Axis Units to Volts, pressing Scale Type (Lin) sets the Y Axis Units to Volts. Pressing Scale Type (Log) again sets the Y Axis Units back to dBm.

Y Axis Units, in conjunction with the Scale Type, affect how the data is read off the display, markers, and over the remote interface. When using the remote interface no units are returned, so you must know what the Y-Axis units are to interpret the results.

Key Path: AMPLITUDE / Y Scale

Dependencies/Couplings: This key is unavailable (grayed out) when the FM Demod View is on.

State Saved: Saved in Instrument State

Factory Preset:

- For Scale Type (Log) = dBm
- For Scale Type (Lin) = Volts

Remote Command:

```
:UNIT:POWer
DBM|DBMV|DBMA|V|W|A|DBUV|DBUA|DBUVM|DBUAM|DBPT|DBG

:UNIT:POWer?
```

Remote Command Notes:

The settings of Y Axis Units and Scale Type, affect how the data is read over the remote interface. When using the remote interface no units are returned, so you must know what the Y-Axis units are to interpret the results:

Example 1, set the following:

Scale Type (Log)

Y Axis Units, dBm

Scale/Div, 1 dB

Ref Level, 10 dBm

This sets the top line to 10 dBm with each vertical division representing 1 dB. Thus, if a point on trace 1 is on the fifth graticule line from the top, it represents 5 dBm and will read out remotely as 5.

Example 2, set the following:

Scale Type (Lin)

Y Axis Units, Volts

Ref Level, 100 mV (10 mV/div)

This sets the top line to 100 mV and the bottom line to 0 V, so each vertical division represents 10 mV. Thus, if a point on trace 1 is on the fifth graticule line from the top, it represents 50 mV and will read out remotely as 50.

Example:

```
UNIT:POW dBmV
UNIT:POW?
```

dBm

Sets the amplitude units to dBm.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBM
```

dBmV

Sets the amplitude units to dBmV.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBMV
```

dBmA

Sets the amplitude units to dBmA.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBMA
```

Volts

Sets the amplitude units to volts.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW V
```

Watts

Sets the amplitude units to watts.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW W
```

Amps

Sets the amplitude units to amps.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW A
```

dBμV

Sets the amplitude units to dBμV.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBUV
```

dBμA

Sets the amplitude units to dBμA.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBUA
```

dBμV/m

Sets the amplitude units to dBμV/m. This is a unit specifically applicable to EMI field strength measurements. In the absence of a correction factor this unit is treated by the instrument exactly as though it were dBmV. You must load an appropriate correction factor using amplitude corrections for this unit to generate meaningful results. Therefore, this key is unavailable unless one of the corrections is turned on (in Amplitude, Corrections menu) and Apply Corrections is set to Yes.

Key Path: AMPLITUDE / Y Scale, More, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBUVM
```

dBμA/m

Sets the amplitude units to dBμA/m. This is a unit specifically applicable to EMI field strength measurements. In the absence of a correction factor this unit is treated by the instrument exactly as though it were dBmV. You must load an appropriate correction factor using amplitude corrections for this unit to generate meaningful results. Therefore, this key is unavailable unless one of the corrections is turned on (in Amplitude, Corrections menu) and Apply Corrections is set to Yes.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBUAM
```

dBpT

Sets the amplitude units to dBpT. This is a unit specifically applicable to EMI field strength measurements. In the absence of a correction factor this unit is treated by the instrument exactly as though it were dBmV. You must load an appropriate correction factor using amplitude corrections for this unit to generate meaningful results. Therefore, this key is unavailable unless one of the corrections is turned on (in Amplitude, Corrections menu) and Apply Corrections is set to Yes.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBPT
```

dBG

Sets the amplitude units to dBG. This is a unit specifically applicable to EMI field strength measurements. In the absence of a correction factor this unit is treated by the instrument exactly as though it were dBmV. You must load an appropriate correction factor using

amplitude corrections for this unit to generate meaningful results. Therefore, this key is unavailable unless one of the corrections is turned on (in Amplitude, Corrections menu) and Apply Corrections is set to Yes.

Key Path: AMPLITUDE / Y Scale, Y Axis Units

Remote Command:

See"Y Axis Units" on page 56.

Example:

```
UNIT:POW DBG
```

Ref Lvl Offset

Adds an offset value to the displayed reference level. The reference level is the absolute amplitude represented by the top graticule line on the display. Reference-level offsets are entered using the keyboard. Offsets are used when a gain or loss occurs between a device under test and the N8201A input. Thus, the signal level measured by the N8201A may be thought of as the level at the input of an external amplitude conversion device. Entering an offset does not affect the trace position or attenuation value, just the displayed value readouts such as reference level and marker amplitudes.

The maximum reference level available is dependent on the reference level offset. That is, Ref Level – Ref Level Offset must be in the range –170 to +30 dBm.

For example, the reference level value range can be initially set to values from –170 dBm to 30 dBm with no reference level offset. If the reference level is first set to –20 dBm, then the reference level offset can be set to values of –50 to +150 dB.

If the reference level offset is first set to –30 dB, then the reference level can be set to values of –200 dBm to 0 dBm. In this case, the reference level is "clamped" at 0 dBm because the maximum limit of +30 dBm is reached with a reference level setting of 0 dBm with an offset of –30 dB. If instead, the reference level offset is first set to 30 dB, then the reference level can be set to values of –140 to +60 dBm.

When a reference level offset is entered, the offset value appears on the left side of the display under Offst (as opposed to frequency offsets which appear at the bottom of the display.) To eliminate an offset, press Ref Lvl Offst, 0, and dB.

Key Path: AMPLITUDE / Y Scale

Annunciation/Annotation: The offset is displayed to the left of the display; third from the top, just below the scale type.

State Saved: Saved in Instrument State

Factory Preset: 0.0 dB

Remote Command:

```
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:RLEVel:OFFSet
<rel_power>(in dB)
```

```
:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:RLEVel:OFFSet?
```

Example:

```
DISP:WIND:TRAC:Y:RLEV:OFFS 12.7
```

Sets the Ref Level Offset to 12.7 dB. The only valid suffix is dB. If no suffix is sent, dB will be assumed.

Int Preamp (Options 1DS and 110 only)

Turns the internal preamp on and off. Option 1DS preamp functions over a frequency range of 100 kHz to 3 GHz. Option 110 preamp functions over a frequency range of 100 kHz to 50 GHz. When the preamp is on, an automatic adjustment compensates for the gain of the preamp so that displayed amplitude readings still accurately reflect the value at the N8201A input connector. The Option 1DS preamp is switched off for frequencies above 3 GHz, and the correction is not applied, even though the PA annotation remains on screen. For signal frequencies below 100 kHz, the preamp is not automatically switched out, but signal amplitude roll-off occurs even in the "DC" setting of the RF Coupling control.

The gain of the preamp is nominally 30 dB. This functionality is not available when using external mixing.

Key Path: AMPLITUDE / Y Scale

State Saved: Saved in Instrument State

Factory Preset: Off

Remote Command:

```
[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1
```

```
[:SENSe]:POWer[:RF]:GAIN[:STATe]?
```

Example:

```
POW:GAIN 1
```

```
POW:GAIN?
```

Corrections

Accesses the Corrections menu keys that allow you to enable the corrections function and to select which set of correction factors you wish to modify. These frequency and amplitude corrections will be applied to the displayed data to correct for system losses or gains outside the N8201A. Four different sets of correction data can be stored.

Key Path: AMPLITUDE / Y Scale, More

Remote Command:

There is no equivalent remote command for this key.

Apply Corrections

Pressing Apply Corrections (Yes) turns on the amplitude-correction factors. Corrections will only be applied for the sets of correction factors whose correction state is set to On. To turn a set of correction factors on, use the Correction On Off key in the Antenna, Cable, Other, or User menus.

Key Path: AMPLITUDE / Y Scale, More, Corrections

Annunciation/Annotation: When Apply Corrections (Yes) is selected, an A will appear in the screen annotation on the left edge of the display, whether or not a correction set has been turned on using the Correction (On) key in the Antenna, Cable, Other, or User menus.

State Saved: Saved in Instrument State

Factory Preset: No

Remote Command:

```
[:SENSe]:CORRection:CSET:ALL[:STATe] OFF|ON|0|1
```

```
[:SENSe]:CORRection:CSET:ALL[:STATe]?
```

Remote Command Notes:

To turn On or Off an individual correction set, use:
`[:SENSe]:CORRection:CSET[1]|2|3|4[:STATe]`

Example:

```
CORR:CSET:ALL ON
```

```
CORR:CSET:ALL?
```

Antenna, Cable, Other, and User Keys

Pressing Antenna, Cable, Other, or User accesses the Correction menu for that type of correction data. These four keys display the status of correction sets. If the key indicates On, then amplitude corrections for this type have been enabled. To perform the corrections, both this key and Apply Corrections must indicate Yes. The status is toggled in the correction set menu located under Correction.

Key Path: AMPLITUDE / Y Scale, More, Corrections

Remote Command:

There is no remote command for this key.

Correction

Turns the amplitude correction function on or off for the specific set of correction data. The corrections state must be set to **On** for the correction to be applied.

Antenna, Cable, and Other correction factors are generally entered as positive values. This indicates a loss in the external device. User correction factors are typically entered as negative values which indicate a gain in the external device.

Key Path: AMPLITUDE / Y Scale, More, Corrections, Antenna (Cable, Other, or User)

State Saved: Saved in Instrument State

Factory Preset: No

Remote Command:

```
[:SENSe]:CORRection:CSET[1]|2|3|4[:STATe] OFF|ON|0|1
```

```
[:SENSe]:CORRection:CSET[1]|2|3|4[:STATe]?
```

Remote Command Notes:

`[:SENSe]:CORRection:CSET:ALL[:STATe]` must be set to on for this command to function.

CSET number equivalents to front-panel access definitions are as follows:

- CSET or CSET1 is Antenna
- CSET2 is Cable
- CSET3 is Other
- CSET4 is User

Example:

```
CORR:CSET2 ON
```

```
CORR:CSET2?
```

Edit

Accesses menu keys that allow you to create and edit an amplitude-correction factor set. It puts the N8201A into a split-screen mode where the correction data is displayed in a table under the trace data. Pressing ESC while in this menu will exit the menu and remove the table from the screen. New points will be applied only after the editor is closed.

Key Path: AMPLITUDE / Y Scale, More, Corrections, Antenna (Cable, Other, or User)

Remote Command:

`[:SENSe]:CORRection:CSET[1]|2|3|4:DATA <freq>,<rel_ampl>{,<freq>,<rel_ampl>}` Creates an amplitude-correction factor set

`[:SENSe]:CORRection:CSET[1]|2|3|4:DATA:MERGe <freq>,<rel_ampl>{,<freq>,<rel_ampl>}` Adds the points with the specified values to the current amplitude correction data, allowing you to merge correction data. If too much data is merged, as many points as possible are merged into the existing data and then an error is reported.

`[:SENSe]:CORRection:CSET[1]|2|3|4:DATA?`

Remote Command Notes:

`[:SENSe]:CORRection:CSET:ALL[:STATe]` must be set to on for this command to function.

CSET number equivalents to front-panel access definitions are as follows:

- CSET or CSET1 is Antenna
- CSET2 is Cable
- CSET3 is Other
- CSET4 is User

<freq> is the frequency (in Hz) where the correction should be applied; no unit is allowed in this parameter

<rel_ampl> is the amount of relative amplitude correction (in dB) needed; no unit is allowed in this parameter

Example:

```
:CORR:CSET2:DATA 900E6,0.3,1.0E9,0.35,1.3E9,0.2
```

Point

Allows you to create or edit an amplitude-correction factor data point. Up to 200 points may be defined for each set. Enter the point number to be created or edited by using the keyboard, then press Enter. After selecting a point, Frequency becomes active.

Key Path: AMPLITUDE / Y Scale, More, Corrections, Antenna (Cable, Other, or User), Edit

State Saved: Not part of instrument state, saved in a corrections file.

Remote Command:

See "Edit" on page 66.

Frequency

Allows you to enter the frequency value for an amplitude-correction point. Enter the frequency value by using the keyboard.

A frequency coordinate must always be specified for amplitude-correction factors. Amplitude-correction data is sorted in the table by frequency. The sorting occurs immediately after you have entered the frequency value via the front-panel.

The amplitude correction entered for the lowest frequency will be applied to all frequencies less than the lowest frequency entered. Similarly, the amplitude correction for the highest frequency entered will be applied to all frequencies greater than the highest frequency entered.

Key Path: AMPLITUDE / Y Scale, More, Corrections, Antenna (Cable, Other, or User), Edit

State Saved: Not part of instrument state, saved in a corrections file.

Remote Command:

See "Edit" on page 66.

Amplitude

Allows you to enter the amplitude value for the current amplitude-correction point. After entering an amplitude, the point number automatically increments and Frequency becomes active to allow entry of the frequency of the next point.

Key Path: AMPLITUDE / Y Scale, More, Corrections, Antenna (Cable, Other, or User), Edit

State Saved: Not part of instrument state, saved in a corrections file.

Remote Command:

See "Edit" on page 66.

Delete Point

Allows you to delete the amplitude-correction data for the currently selected point. The prompt, "If you are sure, press key again to delete" will appear on the display. Pressing Delete Point again will delete the point and adjust all of the point numbers as appropriate.

Key Path: AMPLITUDE / Y Scale, More, Corrections, Antenna (Cable, Other, or User), Edit

Remote Command:

See "Edit" on page 66.

Delete Corrections

Allows you to clear all data from the selected amplitude-correction set. The prompt `If you are sure, press key again to delete` will appear on the display. Pressing Delete again will delete the correction set.

Key Path: AMPLITUDE / Y Scale, More, Corrections, Antenna (Cable, Other, or User)

Remote Command:

```
[:SENSe]:CORRection:CSET[1]|2|3|4:DELete
```

Remote Command Notes: CSET number equivalents to front-panel access definitions are as follows:

- CSET or CSET1 is Antenna
- CSET2 is Cable
- CSET3 is Other
- CSET4 is User

Example:

```
CORR:CSET4:DEL
```

Freq Interp

Allows you to determine how trace values are computed between points in a correction table. If the linear mode is selected, a straight line is used between points in the correction table (for a linear frequency scale and for a decibel amplitude scale). If the logarithmic mode is selected, frequency values between points are computed by first taking the logarithm of both table values and the intermediate value, while using decibel amplitude values.

Key Path: AMPLITUDE / Y Scale, More, Corrections

State Saved: Not saved in instrument state

Factory Preset: Not affected by Factory Preset. Will be set to linear by Restore Factory Defaults.

Remote Command:

```
[:SENSe]:CORRection:CSET[1]|2|3|4:X:SPACing
LINear|LOGarithmic
```

Example:

```
CORR:CSET4:X:SPAC LOG
```

Delete All Corrections

Allows you to delete all amplitude-correction sets.

Key Path: AMPLITUDE / Y Scale, More, Corrections

Dependencies/Couplings: If corrections are on, corrections are turned off.

Remote Command:

```
[:SENSe]:CORRection:CSET:ALL:DELete
```

Example:

```
CORR:CSET:ALL:DEL
```

Ext Amp Gain

Compensates for external gain or loss. The function is similar to the Ref Lvl Offset function, this value is considered, along with the maximum mixer level setting, to determine the attenuation required (10 dB of Attenuation is added for every 10 dB of External Amp Gain). The gain is subtracted from the amplitude readout so that the displayed signal level represents the signal level at the input of the external device.

Gains may be entered with the keyboard or programming commands.

Key Path: AMPLITUDE / Y Scale

State Saved: Saved in Instrument State, and survives a Preset and power cycle.

Factory Default: 0 dB

Range: –81.90 dB to 81.90 dB

Ext Amp Gain is not affected by Factory Preset or power cycle. It can be reset to the factory default by pressing System, Restore Sys Defaults.

Remote Command:

```
[:SENSe]:CORRection:OFFSet[:MAGNitude] <relative_power> (in dB)

[:SENSe]:CORRection:OFFSet[:MAGNitude]?
```

Example:

```
CORR:OFFS:MAGN 7.3 DB
```

Sets the Ext Amp Gain to 7.3 dB. The only valid suffix is dB. If no suffix is sent, dB is assumed.

Atten Step

Permits the selection of 2 dB or 10 dB step resolution for input attenuation.

Key Path: AMPLITUDE / Y Scale

Saved State: Saved in Instrument State

Factory Preset: 2 dB

Remote Command:

```
[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] <integer>
(in dB)
```

```
[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]?
```

Example:

```
POW:ATT:STEP 10
```

Sets the Attenuation to 10 dB. The only valid suffix is dB. If no suffix is sent, dB is assumed.

If a value >5 is entered, 10 is used.

If a value ≤5 is entered, 2 is used

Max Mixer Lvl

Enables you to set the relationship between the highest signal that can be displayed (the reference level) and the input attenuation. The relationship applies whenever the Attenuation is set to Auto. The relationship is that the attenuation is given by the reference level minus the maximum mixer level. For example, as the reference level changes, the input attenuator changes to ensure that a signal at the reference level does not exceed the Max Mixer Lvl setting.

Key Path: AMPLITUDE / Y Scale

State Saved: Saved in Instrument State

Factory Preset: –10 dBm

Range:

–50 dBm to –10 dBm (internal mixing)

–50 dBm to +10 dBm (external mixing)

Remote Command:

```
[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <power>
[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]?
```

Example:

```
POW:MIX:RANG -15 dBm
```

3 Auto Couple

Coupled functions are functions that are linked to or dependent on other functions. Pressing Auto Couple displays some of the most important coupled N8201A functions.

An example of a coupled function is Res BW (resolution bandwidth). When Res BW is set to auto, the Res BW is automatically set based on the span setting.

Coupled functions are affected depending on how they are coupled. For example, Video BW is coupled to Res BW, so changing Res BW affects Video BW, but changing Video BW does not affect Res BW. Changing Video BW puts it in manual (instead of auto-coupled). When Video BW is set to Man it is unaffected by Res BW changes.

When a function is in the Man state, a # will appear next to its annotation on the display. If one or more functions are manually set so that the amplitude or frequency measurement becomes uncalibrated, "Meas Uncal" appears on the top right side of the graticule.

Auto All

When Auto All is pressed, the N8201A automatically couples all instrument settings that have auto and manual choices. In most cases, these auto settings give the most accurate measurements and optimum dynamic range. When a function is coupled, it is in the Auto state. When it is uncoupled it is in the Man state.

Key Path: Auto Couple

Dependencies/Couplings: When Auto All is selected:

- Resolution BW couples to: Span and Span/RBW
- Video BW couples to: Res BW and VBW/RBW
- Sweep Time couples to: Res BW; Video BW; Detector; Span and Center Frequency
- CF Step couples to: Span in swept spans, to Res BW in zero span
- Attenuation couples to: Ref Level; Ext Amp Gain; Atten Step; Max Mixer Lvl; and Int Preamp
- FFT & Sweep couples to: Res BW and Span
- PhNoise Opt (phase noise optimization) couples to: Res BW; Span and FFT & Sweep sweep type
- Detector couples to: marker functions; Avg/VBW Type; Average On Off; Max Hold and Min Hold
- Average Type couples to: the marker functions; Detector and Scale Type
- ADC Dither couples to: Sweep Type; Span; Res BW; ADC Ranging and FFTs/Span
- VBW/RBW ratio is set to 1.0
- Span/RBW ratio is set to Auto
- Auto Sweep Time is set to Normal
- FFT & Sweep is set to Auto:Best Dynamic Range
- ADC Ranging is set to Autorange
- Marker Count, Gate Time is set to Auto
- Marker Trace and Printer have an Auto setting, but are not affected by Auto All.

Remote Command:

```
:COUPle ALL|NONE
```

```
:COUPle?
```

Remote Command Notes:

`COUPle NONE` sets all the functions to the manual (not coupled) mode. There is no front-panel key equivalent to the `COUPle NONE` command.

`COUPle ALL` puts all the functions into the auto coupled mode.

Example:

```
COUP ALL
```

FFT & Sweep

Selects the FFT vs. Sweep key functions.

FFT “sweeps” should not be used when making EMI measurements. When an EMI detector is selected, Manual:FFT is grayed out. If Manual:FFT is selected first, the EMI detectors are grayed out.

Key Path: Auto Couple

Remote Command:

`[:SENSe]:SWEep:TYPE AUTO|FFT|SWEep`

Changes the sweep type to FFT or swept, or it lets the N8201A automatically choose the type of analysis to use based on current instrument settings.

`[:SENSe]:SWEep:TYPE?`

Example:

`SWE:TYPE FFT`

Auto: Best Dynamic Range

This function is automatically activated when Auto All is selected. Selecting Auto: Best Dynamic Range tells the N8201A to choose between swept and FFT analysis, with a primary goal of optimizing the dynamic range. If the dynamic range is very close between swept and FFT, then it chooses the faster one.

While Zero Span is selected, this key is grayed out. The status of the FFT & Swept selection is saved when entering zero span and is restored when leaving zero span.

Key Path: Auto Couple, FFT & Sweep

Saved State: Saved in Instrument State

Remote Command:

`[:SENSe]:SWEep:TYPE:AUTO:RULes SPEed|DRANge`

Selects the rules to use when SWE:TYPE AUTO is selected. This setting, combined with your current N8201A setup, is used to select either FFT or swept mode.

`[:SENSe]:SWEep:TYPE:AUTO:RULes?`

Example:

`SWEep:TYPE AUTO` selects the automatic mode.

SWE:TYPE:AUTO:RUL DRAN sets the rules for the auto mode to dynamic range.

Auto: Best Speed

Selecting Auto: Best Speed tells the N8201A to choose between FFT or swept analysis based on the fastest N8201A speed. While Zero Span is selected, this key is grayed out. The auto-couple settings are kept in memory and are restored whenever leaving Zero Span.

Key Path: Auto Couple, FFT & Sweep

Saved State: Saved in Instrument State

Remote Command:

[:SENSe]:SWEep:TYPE:AUTO:RULes SPEed|DRANge

Selects the rules to use when SWE:TYPE AUTO is selected. This setting, combined with your current N8201A setup, is used to select either FFT or swept mode.

See "Auto: Best Dynamic Range" on page 76.

Example:

SWEep:TYPE AUTO selects the automatic mode.

SWE:TYPE:AUTO:RUL SPE sets the rules for the auto mode to speed

Manual: Swept

Manually selects swept analysis, so it cannot change automatically to FFT.

While Zero Span is selected, this key is grayed out. The status of the FFT & Swept selection is saved when entering zero span and is restored when leaving zero span.

Key Path: Auto Couple, FFT & Sweep

Saved State: Saved in Instrument State

Remote Command:

[:SENSe]:SWEep:TYPE AUTO|FFT|SWEep

See "FFT & Sweep" on page 76.

Example:

SWE:TYPE SWE

Manual: FFT

Manually selects FFT analysis, so it cannot change automatically to swept.

While Zero Span is selected, this key is grayed out. The status of the FFT & Swept selection is saved when entering zero span and is restored when leaving zero span.

Tip: Making Gated FFT Measurements

The process of making a spectrum measurement with FFTs is inherently a "gated" process, in that the spectrum is computed from a time record of short duration, much like a gate signal in swept-gated analysis.

The duration of the time record is 1.83 divided by the RBW, within a tolerance of about 3% for bandwidths up through 1 MHz. Therefore, unlike swept gated analysis, the duration of the analysis is fixed by the RBW, not by the gate signal. Because FFT analysis is inherently faster than swept analysis, the gated FFT measurements can have better frequency resolution (a narrower RBW) than would swept analysis for a given duration of the signal to be analyzed.

FFT analysis in the N8201A usually involves making auto ranged measurements, and the time required to autorange the FFT can be both long and inconsistent. The N8201A hardware automatically sets the ADC Ranging to Bypass when any trigger, except Free Run is selected.

To make a gated FFT measurement, set the N8201A as follows.

1 Press **Auto Couple, FFT & Sweep** to select **Manual: FFT**.

2 Set the resolution bandwidth to 1.83 divided by the required analysis time, or higher, by pressing **BW/Avg, Res BW**.

3 Set the trigger source to the desired trigger, by pressing **Trig**.

4 Set the trigger delay to observe the signal starting at the required time relative to the trigger. Negative delays are possible, by pressing **Trig, Trig Delay.**

Key Path: Auto Couple, FFT & Sweep

Remote Command:

```
[:SENSe]:SWEep:TYPE AUTO|FFT|SWEep
```

See "FFT & Sweep" on page 76.

Example:

```
SWE:TYPE FFT
```

FFTs/Span

Displays and controls the number of FFT segments used to measure the entire Span. This key is unavailable (grayed out) unless Sweep Type has been set to FFT. If Sweep Type is set to Auto and FFTs are selected, FFTs/Span is still unavailable, and the number of FFTs automatically selected is shown. If Sweep Type is set to Manual:FFT, FFTs/Span becomes available. Press FFTs/Span and an integer can be entered. The N8201A will try to use the number entered, but it may need to use more due to hardware or software limitations.

An FFT can only be performed over a limited span or segment (also known as the FFT width). Several FFT widths may need to be combined to measure the entire span. The "FFT Width" is (Span)/(FFTs/Span), and affects the ADC Dither function. (See Auto Couple).

FFT measurements require that the signal level driving the A/D converter in the IF be small enough to avoid overloading, and that the gain that controls that signal level remain fixed during the measurement of an entire FFT segment. This constraint can allow higher dynamic ranges in swept mode in some cases, but increasing FFTs/Span can restore that dynamic range to FFT measurements, at the expense of losing some of the speed advantages of the FFT.

For example, in pulsed-RF measurements such as radar, it is often possible to make high dynamic range measurements with signal levels approaching the compression threshold of the N8201A in swept spans (well over 0 dBm), while resolving the spectral components to levels below the maximum IF drive level (about –8 dBm at the input mixer). But FFT processing experiences overloads at the maximum IF drive level even if the RBW is small enough that no single spectral component exceeds the maximum IF drive level. If the user reduces the width of an FFT using the FFTs/Span function, an analog filter is placed before the ADC that is about 1.3 times as wide as the FFT segment width. This spreads out the pulsed RF in time and reduces the maximum signal level seen by the ADC. Therefore, the input attenuation can be reduced and the dynamic range increased without overloading the ADC.

Further improvement in the dynamic range is possible by changing the ADC gain. In swept analysis in N8201A, the gain is normally auto ranged such that it can track the signal power as the N8201A sweeps through CW-like signals. Since FFT processing cannot autorange the gain within the measurement of a single FFT segment, the autoranging advantage is lost for single FFT measurements. But if the segments are reduced in width by using more FFTs/Span, then individual FFT segments can use higher gains, improving the dynamic range.

Additional information about selecting FFTs/Span can be found in a product note, "PSA Series Swept and FFT Analysis," literature number 5980-3081EN, available on-line through http://www.agilent.com.

Key Path: Auto Couple, FFT & Sweep

State Saved: Saved in Instrument State

Factory Preset: 1

Range: 1 to 400000

Remote Command:

```
[:SENSe]:SWEep:FFT:SPAN:RATio <integer>
```

```
[:SENSe]:SWEep:FFT:SPAN:RATio?
```

Example:

```
SWE:FFT:SPAN:RAT 20
```

PhNoise Opt

Selects the LO (local oscillator) phase noise behavior for various operating conditions. The currently selected value is displayed below the £(f) indicator on the left side of the screen. It is preceded by # if Auto has been selected (#£(f)). The key labels indicate measurement situations where a specific type of optimization is best.

Key Path: Auto Couple

State Saved: Saved in Instrument State

Factory Preset: Auto

Remote Command: [:SENSe]:FREQuency:SYNThesis 1|2|3

1, selects optimization of phase noise for measuring signals with frequency offset <50 kHz from the carrier.

2, selects optimization of phase noise for measuring signals with frequency offset >50 kHz from the carrier.

3, selects optimization of LO phase noise for fast tuning (that is, faster measurements)

```
[:SENSe]:FREQuency:SYNThesis?
```

```
[:SENSe]:FREQuency:SYNThesis:AUTO OFF|ON|0|1
```

```
[:SENSe]:FREQuency:SYNThesis:AUTO?
```

Example:

```
FREQ:SYNT:AUTO OFF
```

`FREQ:SYNT 3`, selects optimization for fast tuning

Auto

Selects the LO phase noise behavior to optimize speed or dynamic range for various instrument operating conditions.

The Auto rules choose:

- Fast Tuning, for span Š 10.5 MHz or the Res BW > 200 kHz
- Optimize £(f) for f >50 kHz, for spans >141.4 kHz, and for Res BWs >9.1 kHz
- Optimize £(f) for f <50 kHz, for all other spans and Res BWs.

Key Path: Auto Couple, PhNoise Opt

Remote Command:

See "PhNoise Opt" on page 81.

Example:

```
FREQ:SYNT:AUTO ON
```

Optimize £(f) for frequencies < 50 kHz

The LO phase noise is optimized for measuring signals with offsets less than 50 kHz from the carrier, at the expense of phase noise beyond 50 kHz offset.

Key Path: Auto Couple, PhNoise Opt

Remote Command:

See "PhNoise Opt" on page 81.

Example:

```
FREQ:SYNT 1
```

Optimize £(f) for frequencies > 50 kHz

Optimizes phase noise for measuring offsets greater than 50 kHz from the carrier, especially those from 70 kHz to 300 kHz. Closer offsets are compromised and the throughput of measurements (especially remote measurements where the center frequency is changing rapidly), is reduced.

Key Path: Auto Couple, PhNoise Opt

Remote Command:

See "PhNoise Opt" on page 81.

Example:

```
FREQ:SYNT 2
```

Optimize LO for Fast Tuning

In this mode, the LO behavior compromises phase noise at all offsets from the carrier below approximately 2 MHz. This allows rapid measurement throughput when changing the center frequency or span.

Key Path: Auto Couple, PhNoise Opt

Remote Command:

See "PhNoise Opt" on page 81.

Example:

```
FREQ:SYNT 3
```

Detector

See the section "Detector Auto Manual" on page 106.

Key Path: Auto Couple

Avg/VBW Type

See the section "Avg/VBW Type" on page 85.

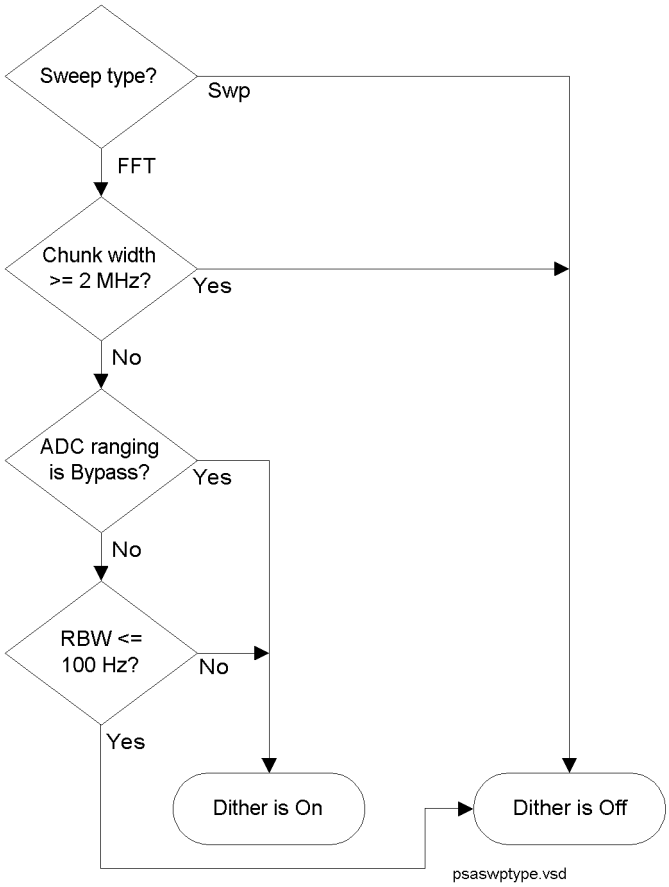
Key Path: Auto Couple

ADC Dither

Auto Turns the ADC dither to automatic. It then chooses on or off according to which is most likely to be the best selection, based on the other N8201A settings such as span, resolution BW and sweep type (FFT or swept).

On When ADC Dither is On, the linearity of low-level signals is improved. However, the ADC dynamic range is reduced to make room for the dither. As a result, the noise floor of the N8201A is somewhat compromised. So making measurements with ADC dither on gives you better amplitude linearity, but turning ADC dither off gives you a lower noise floor (better sensitivity).

Off When ADC Dither is Off, the instrument noise floor is improved. If ADC dither is on the ADC dynamic range is reduced to make room for the dither. As a result, the noise floor of the N8201A is somewhat compromised. So making measurements with ADC dither on gives you improved amplitude linearity, but turning ADC dither off gives you a lower noise floor (better sensitivity).



Remote Command:

```
[:SENSe]:ADC:DITHer[:STATe] OFF|ON|AUTO
[:SENSe]:ADC:DITHer[:STATe]?
```

Example:

```
ADC:DITH OFF
```

ADC Ranging

Accesses the keys to set the ADC ranging to provide for the best signal to noise ratio (Bypass), or for the best FFT speed (Autorange).

Key Path: Auto Couple

State Saved: Saved in Instrument State

Factory Preset: Autorange

Remote Command:

```
[:SENSe]:ADC:RANGe AUTO|NONE
```

```
[:SENSe]:ADC:RANGe?
```

Example:

```
ADC:RANG NONE
```

Auto Ranging

Turns the ADC ranging to automatic which provides the best signal to noise ratio. Auto Couple All sets the ADC ranging to Autorange. Autorange is usually preferred over Bypass.

Key Path: Auto Couple

State Saved: Saved in Instrument State

Remote Command:

```
[:SENSe]:ADC:RANGe AUTO
```

Example:

ADC:RANG AUTO

Autorange (Best S/N)

Turns the ADC ranging to automatic which provides the best signal to noise ratio.

Key Path: Auto Couple, Auto Ranging

State Saved: Saved in Instrument State

Remote Command:

```
[:SENSe]:ADC:RANGe AUTO
```

Example:

ADC:RANG AUTO

Bypass (Best £(f))

Turning the ADC ranging to bypass mode allows higher throughput for FFT measurements. (It can improve FFT measurement speed by 10% to 50%.) Bypass also provides better phase noise, though the effect is negligible when using swept analysis or for offsets below 300 kHz. The £(f) improvement is a few dB in FFT mode at 800 kHz offset.

Bypass allows triggered FFT measurements to occur at the trigger time instead of following an autoranging time. Therefore, whenever the trigger selected is anything other than Free Run, and the Manual:FFT sweep selection is made, the ADC hardware is set to Bypass regardless of the setting of ADC Ranging. See "Tip: Making Gated FFT Measurements" on page 78. Another advantage of Bypass is lower IF harmonic distortion, which may be visible with very high signal levels at the input mixer.

Key Path: Auto Couple, Auto Ranging

State Saved: Saved in Instrument State

Remote Command:

```
[:SENSe]:ADC:RANGe NONE
```

Example:

```
ADC:RANG NONE
```

4 BW/Avg

Activates the resolution bandwidth function, and displays the menu keys that control both the bandwidth and averaging functions.

Res BW

Enables you to select the 3.01 dB resolution bandwidth (RBW) of the N8201A in 10% steps from 1 Hz to 3 MHz, plus bandwidths of 4, 5, 6, or 8 MHz.

If an unavailable bandwidth is entered, the closest available bandwidth is selected.

Sweep time is coupled to RBW. As the RBW changes, the sweep time (if set to Auto) is changed to maintain amplitude calibration.

Video bandwidth (VBW) is coupled to RBW. As the resolution bandwidth changes, the video bandwidth (if set to Auto) changes to maintain the ratio set by VBW/RBW.

When Res BW is set to Auto, resolution bandwidth is autocoupled to span, except when using the CISPR and MIL detectors (Quasi Peak, EMI Average EMI Peak and MIL Peak). For these detectors, Auto RBW coupling is to the center frequency. The ratio of span to RBW is set by Span/RBW (described on page 104). The factory default for this ratio is approximately 106:1 when auto coupled. When Res BW is set to Man, bandwidths are entered by the user, and these bandwidths are used regardless of other N8201A settings.

In zero span, the auto/manual function of this key is not applicable. When Res BW (Auto) is selected in non-zero span, any changes to Res BW while in zero span will revert to the Auto value when you return to non-zero span. When Res BW (Man) is selected in non-zero span, any changes to Res BW while in zero span will be maintained when you return to non-zero span.

When the Quasi Peak or one of the EMI detectors is selected, the resolution bandwidths available are restricted to the set defined in Table 2 on page 116. When the MIL Peak detector is selected, the resolution bandwidths available are restricted to the set defined in Table 4 on page 120.

A # mark appears next to `Res BW` on the bottom of the display when it is not coupled. To couple the resolution bandwidth, press Res BW (Auto).

For applications that require 6 dB resolution bandwidths, it is possible to use an equivalent 3 dB resolution bandwidth. Because the N8201A has Gaussian RBW, the equivalent 6 dB bandwidth of any RBW filter can be determined using the following formula: *6 dB RBW = 3 dB RBW* x *1.414*. For example, if a 6 dB RBW of 100 kHz is required, the equivalent 3 dB RBW filter would be 100 kHz/1.414 = 70.7 kHz. The closest RBW filter for the N8201A that would be used is 68 kHz.

Key Path: BW/Avg

Saved State: Saved in Instrument State

Factory Preset: Auto (3 MHz)

Range: 1 Hz to 8 MHz

Remote Command:

[:SENSe]:BANDwidth|BWIDth[:RESolution] <freq>

[:SENSe]:BANDwidth|BWIDth[:RESolution]?

[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1

[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO?

Example:

BAND 1 kHz

BAND?

BWID:AUTO ON

BWID:AUTO?

Video BW

Enables you to change the N8201A post-detection filter from 1 Hz to 8 MHz in approximately 10% steps. In addition, a wide-open video filter bandwidth (VBW) may be chosen by selecting 50 MHz. Video BW (Auto) selects automatic coupling of the Video BW filter to the resolution bandwidth filter using the VBW/RBW ratio set by the VBW/RBW key.

Sweep Time is coupled to Video Bandwidth (VBW). As the VBW is changed, the sweep time (when set to Auto) is changed to maintain amplitude calibration. This occurs because of common hardware between the two circuits, even though the Video BW filter is not actually "in-circuit" when the detector is set to Average. Because the purpose of the average detector and the VBW filter are the same, either can be used to reduce the variance of the result.

Although the VBW filter is not "in-circuit" when using the average detector, the Video BW key can have an effect on (Auto) sweep time, and is not disabled. In this case, reducing the VBW setting increases the sweep time, which increases the averaging time, producing a lower-variance trace.

However, when the EMI Average detector is selected, the Video BW is restricted to 1 Hz while the sweep time is set to Auto.

When using the average detector with either Sweep Time set to Man, or in zero span, the Video BW setting has *no* effect and is disabled (grayed out).

A "#" mark appears next to VBW on the bottom of the N8201A display when it is not coupled. To couple the video bandwidth, press Video BW (Auto).

Key Path: BW/Avg

Saved State: Saved in Instrument State

Factory Preset: Auto (3 MHz)

Range: 1 Hz to 50 MHz

Remote Command:

[:SENSe]:BANDwidth|BWIDth:VIDeo <freq>

[:SENSe]:BANDwidth|BWIDth:VIDeo?

[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO OFF|ON|0|1

[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO?

Example:

BAND:VID 1 kHz

BAND:VID?

BWID:VID:AUTO ON

BWID:VID:AUTO?

VBW/RBW

Selects the ratio between the video and resolution bandwidths in a 1, 3, 10 sequence. Video bandwidth wider than resolution bandwidth (VBW/RBW ratio > 1.000), provides the best peak measurements of signals such as wideband radar pulses. VBW narrower than RBW (VBW/RBW ratio < 1.000) reduces the variance of noise-like signals and makes spectral components close to the noise floor easier to view. Pressing Preset or selecting Auto Couple, Auto All sets the ratio to 1.000 X. When VBW/RBW (Auto) is selected, the ratio is determined as indicated in Table 1.

This key is grayed out when the Quasi Peak or EMI Average detector is selected.

Table 1 VBW/RBW Ratio Auto Rules

Detector Mode	Noise Marker	Ratio	Notes
Peak	On	10	Noise response is estimated for wide VBW case
Negative Peak	On	10	Don't care
Average	On	0.1	Narrow VBW for low-sigma marker readout
Normal	On	0.1	Don't care (noise marker makes is not valid with normal detection.)
Sample	On	0.1	Narrow VBW for low-sigma marker readout
Peak	Off	10	Wide VBW for good impulse BW (pulsed RF)
Negative peak	Off	10	Don't care
Average	Off	0.1	Narrow VBW for low-sigma trace results
Normal	Off	1.0	Swept analysis CW signal setting
Sample	Off	1.0	Wide VBW for good impulse BW (pulsed RF)

Key Path: BW/Avg

Saved State: Saved in Instrument State

Factory Preset: Auto (1.0)

Range: 0.00001 to 3.0e6 (3,000,000), in a 1, 3, 10 sequence

Remote Command:

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio <number>

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio?

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO OFF|ON|0|1

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO?

Example:

BAND:VID:RAT 2

BAND:VID:RAT?

BAND:VID:RAT:AUTO 0

BAND:VID:RAT:AUTO?

Average

Initiates a digital averaging routine that averages the trace points in a number of successive sweeps, resulting in trace "smoothing." You can select the number of sweeps (average number) with the keyboard. Increasing the average number further smooths the trace. To select the type of averaging used, press **BW/Avg, Avg/VBW Type**.

Averaging restarts when any of the following occurs:

- a new average number is entered.
- any measurement related parameter (for example, center frequency) is changed.
- Restart is pressed.
- Single Sweep is pressed.

  In single sweep, the specified number of averages is taken, then the sweep stops. In continuous sweep, the specified number of averages is taken, then the averaging continues, with each new sweep averaged in with a weight of $\frac{1}{\text{Average Number}}$ and the old average reduced by multiplying it by $\frac{\text{Average Number} - 1}{\text{Average Number}}$.

To turn off averaging, press Average (Off).

Key Path: BW/Avg

Saved State: Saved in Instrument State

Factory Preset: Off, 100 averages

Range: Count: 1 to 8192

Remote Commands:

[:SENSe]:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:AVERage[:STATe]?

[:SENSe]:AVERage:COUNt <integer>

[:SENSe]:AVERage:COUNt?

[:SENSe]:AVERage:CLEar

Remote Command Notes:

For valid average data, you must restart the trace at the beginning of a sweep. To do this remotely, first abort (`:ABORT`) the sweep and then initiate a single sweep (`:INIT:CONT OFF`).

When Average is remotely turned on, the N8201A automatically initiates a sweep, even when set to single sweep mode. To avoid program timing problems, this event should be considered when programming.

Example:

AVER ON

AVER:COUN 100

AVER:CLE clears the current average and restarts the averaging process.

Avg/VBW Type

Displays the functions that enable you to automatically or manually choose one of the following averaging scales: log-power averaging (video), power averaging (RMS), or voltage averaging.

When you select log-power averaging, the measurement results are the average of the signal level in logarithmic units (decibels). When you select power averaging (RMS), all measured results are converted into power units before averaging and filtering operations, and converted back to decibels for displaying. *Remember*: there can be significant differences between the average of the log of power and the log of the average power.

The following are the averaging processes within the N8201A, all of which are affected by this setting:

Trace averaging (see BW/Avg) averages signal amplitudes on a trace-to-trace basis.

Average detector (see Detector, Average) averages signal amplitudes during the time or frequency interval represented by a particular measurement point.

Noise Marker (see Marker Noise) averages signal amplitudes across measurement points to reduce variations for noisy signals.

VBW filtering adds video filtering which is a form of averaging of the video signal.

When Auto is selected, averaging for the current instrument measurement settings is chosen

Auto selects Power (RMS) Averaging if Marker Noise is on, Band/Intvl Power is on, or Detector is set to Man and Average. It selects Voltage Averaging if Amplitude, Scale Type is set to Lin or Detector is set to Quasi Peak or EMI Average. For other conditions, Auto selects Log-Power Average.

When manual is selected, the type is shown on the left side of the display with a #. When auto is selected, the N8201A chooses the type of averaging. When one of the average types is selected manually, the N8201A uses that type regardless of other N8201A settings, and sets Avg/VBW Type to Man.

Key Path: BW/Avg or Auto Couple

Saved State: Saved in Instrument State

Factory Preset: Auto (Log-power)

Remote Command:

[:SENSe]:AVERage:TYPE RMS|LOG|SCALar

[:SENSe]:AVERage:TYPE?

[:SENSe]:AVERage:TYPE:AUTO OFF|ON|0|1

[:SENSe]:AVERage:TYPE:AUTO?

Example:

AVER:TYPE RMS Sets Power (RMS) averaging

AVER:TYPE SCAL Sets Voltage averaging

AVER:TYPE LOG Sets Log-Power (video) averaging

Log-Pwr Avg (Video)

Selects the logarithmic (decibel) scale for all filtering and averaging processes. This scale is sometimes call "Video" because it is the most common display and analysis scale for the video signal within the N8201A. This scale is excellent for finding CW signals near noise, but its response to noise-like signals is 2.506 dB lower than the average power of those noise signals. This is compensated for in the Marker Noise function. When this type of averaging is selected, LgAv appears on the left side of the display.

The equation for trace averaging on the log-pwr scale is shown below, where N is the number of averages accumulated. (In continuous sweep mode, once N has reached the Average Number, N stays at that value, providing a running average.)

$$\text{New avg} = \frac{(N-1)Oldavg + Newdata}{N}$$

Assumes all values in decibel scale.

Key Path:

BW/Avg, Avg/VBW Type

or

Auto Couple, Avg/VBW Type

Remote Command:

See"Avg/VBW Type" on page 100.

Example:

AVER:TYPE LOG

Pwr Avg (RMS)

In this average type, all filtering and averaging processes work on the power (the square of the magnitude) of the signal, instead of its log or envelope voltage. This scale is best for measuring the true time power of complex signals. This scale is sometimes called RMS

because the resulting voltage is proportional to the square root of the mean of the square of the voltage. When this type of averaging is selected, PAvg appears on the left side of the display.

In the equation for averaging on this scale (below), N is the number of averages accumulated. (In continuous sweep mode, once N has reached the Average Number, N stays at that value.)

$$\text{New Avg} = 10 \times \log\left(\frac{(N-1) \times 10^{\frac{\text{Old Avg}}{10}} + 10^{\frac{\text{New data}}{10}}}{N}\right)$$

Assumes all values in dB.

Key Path:

BW/Avg, Avg/VBW Type

or

Auto Couple, Avg/VBW Type

Remote Command:

See"Avg/VBW Type" on page 100.

Example:

AVER:TYPE RMS

Voltage Avg

In this Average type, all filtering and averaging processes work on the voltage of the envelope of the signal. This scale is good for observing rise and fall behavior of AM or pulse-modulated signals such as radar and TDMA transmitters, but its response to noise-like signals is 1.049 dB lower than the average power of those noise signals. This is compensated for in the Marker Noise function. When this type of averaging is selected, VAvg appears on the left side of the display.

In the equation for averaging on this scale (below), N is the number of averages accumulated. (In continuous sweep mode, once N has reached the Average Number, N stays at that value.)

$$\text{New Avg} = 20 \times \log\left(\frac{(N-1) \times 10^{\frac{\text{Old Avg}}{20}} + 10^{\frac{\text{New data}}{20}}}{N}\right)$$

Assumes all values in dB.

Key Path:

BW/Avg, Avg/VBW Type

or

Auto Couple, Avg/VBW Type

Remote Command:

See"Avg/VBW Type" on page 100.

Example:

AVER:TYPE SCAL

Span/RBW

Selects the ratio between span and resolution bandwidth. A factory preset sets the ratio to 106:1. The ratio can be changed using the keyboard.

This key is grayed out when any of the EMI detectors are selected.

Key Path: BW/Avg

Saved State: Saved in Instrument State

Factory Preset: 106:1

Range: 2 to 10,000

Remote Command:

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio <value>

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio?

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO?

Example:

FREQ:SPAN:BAND:RAT 200 sets a ratio of 200:1, and turns off the auto coupling.

FREQ:SPAN:BAND:RAT:AUTO ON

FREQ:SPAN:BAND:RAT?

5 Det/Demod

Displays the menu keys that select the detector.

Detector Auto Manual

This menu allows you to select a specific type of detector, or choose Auto to let the instrument select the appropriate detector for a particular measurement.

Auto

The system selects normal detection as the default, but if a condition arises where a different type of detection scheme would be better utilized, the system uses the alternate scheme. For example, when in Auto mode, the Marker Noise function uses Average detection because the system determines that the average detector has better speed or variance trade-offs for noise-type signals.

Refer to Figure 1 on page 109, which shows a decision tree of how detection type is determined.

When the Detector choice is Auto, the detector selected depends on marker functions, trace functions, and the trace averaging function.

See Figure 1 on page 109 for information on the Auto detector selection.

When you manually select a detector (instead of selecting Auto), that detector is used regardless of other N8201A settings.

The detector choices are:

- Normal - displays the peak of CW-like signals and maximums and minimums of noise-like signals.
- Average - displays the average of the signal within the bucket. The averaging method depends upon Avg Type selection (voltage, power or log scales).
- Peak - displays the maximum of the signal within the bucket.
- Sample - displays the instantaneous level of the signal at the center of the bucket represented by each display point.
- Negative Peak - displays the minimum of the signal within the bucket.
- Quasi Peak - a fast-rise, slow-fall detector used in making CISPR compliant EMI measurements.

EMI Average – displays the instantaneous level of the signal at the center of the bucket, just like the sample detector. Also changes the auto coupling of VBW, RBW and Avg/VBW Type and the set of available RBWs. Used in making CISPR-compliant measurements.

- **EMI Peak** – the same as the Peak detector but uses CISPR related bandwidths.
- **MIL Peak** – the same as the Peak detector but uses MIL related bandwidths.

Because they may not find the true peak of a spectral component, neither average nor sample detectors measure amplitudes of CW signals as accurately as peak or normal, but they do measure noise without the biases of peak detection.

The detector in use is indicated on the left side of the display, just below Reference level. The designators are:

- Norm - Normal detector
- Avg - Average detector
- Peak - Peak detector
- Samp - Sample detector
- NPk - Negative Peak detector
- EmiQP - Quasi Peak detector
- EmiAv - EMI Average detector
- EmiPk - Peak detector with CISPR bandwidths
- MILPk - Peak detector with MIL bandwidths

If the detector has been manually selected, a "#" appears next to it.

When discussing detectors, it is important to understand the concept of a trace "bucket." For every trace point displayed in swept and zero-span analysis, there is a finite time during which the data for that point is collected. The N8201A has the ability to look at all of the data collected during that time and present a single point of trace data based on the detector mode. We call the interval during which the data for that trace point is being collected, the "bucket." The data is sampled rapidly enough within a "bucket" that it must be reduced in some fashion to yield a single data point for each bucket. There are a number of ways to do this and which way is used depends on the detector selected. Details on how each detector does this are presented below.

In FFT analysis, the bucket represents just a frequency interval. The detector in an FFT mode determines the relationship between the spectrum computed by the FFT and the single data point displayed for the bucket.

Tip: RMS Detection

To measure the average power (RMS voltage) in each display point, set Detector to Average, and verify that Avg/VBW Type is set to Pwr Avg (RMS).

Key Path: Det/Demod

State Saved: Saved in Instrument State

Factory Preset:

Normal, Auto Coupled

Remote Command:

[:SENSe]:DETector[:FUNCtion]
NORMal | AVERage | POSitive | SAMPle | NEGative | QPEak | EAVerage | EPOSitive | MPOSitiv | RMS

[:SENSe]:DETector[:FUNCtion]?

The query returns a name that corresponds to the detector mode as shown by the following terms:

NORMal	Normal
AVERage	Average
POSitive	Peak
SAMPle	Sample
NEGative	Negative peak
QPEak	Quasi Peak
EAVerage	EMI Average
EPOSitive	EMI Peak
MPOSitive	MIL Peak
RMS	RMS (alias)

Remote Command Notes:

The query returns a name that corresponds to the detector mode. The RMS selection is an alias which selects the Average detector and Power Averaging. Therefore, if RMS has been selected, the query will return the AVER string.

Example:

DET POS

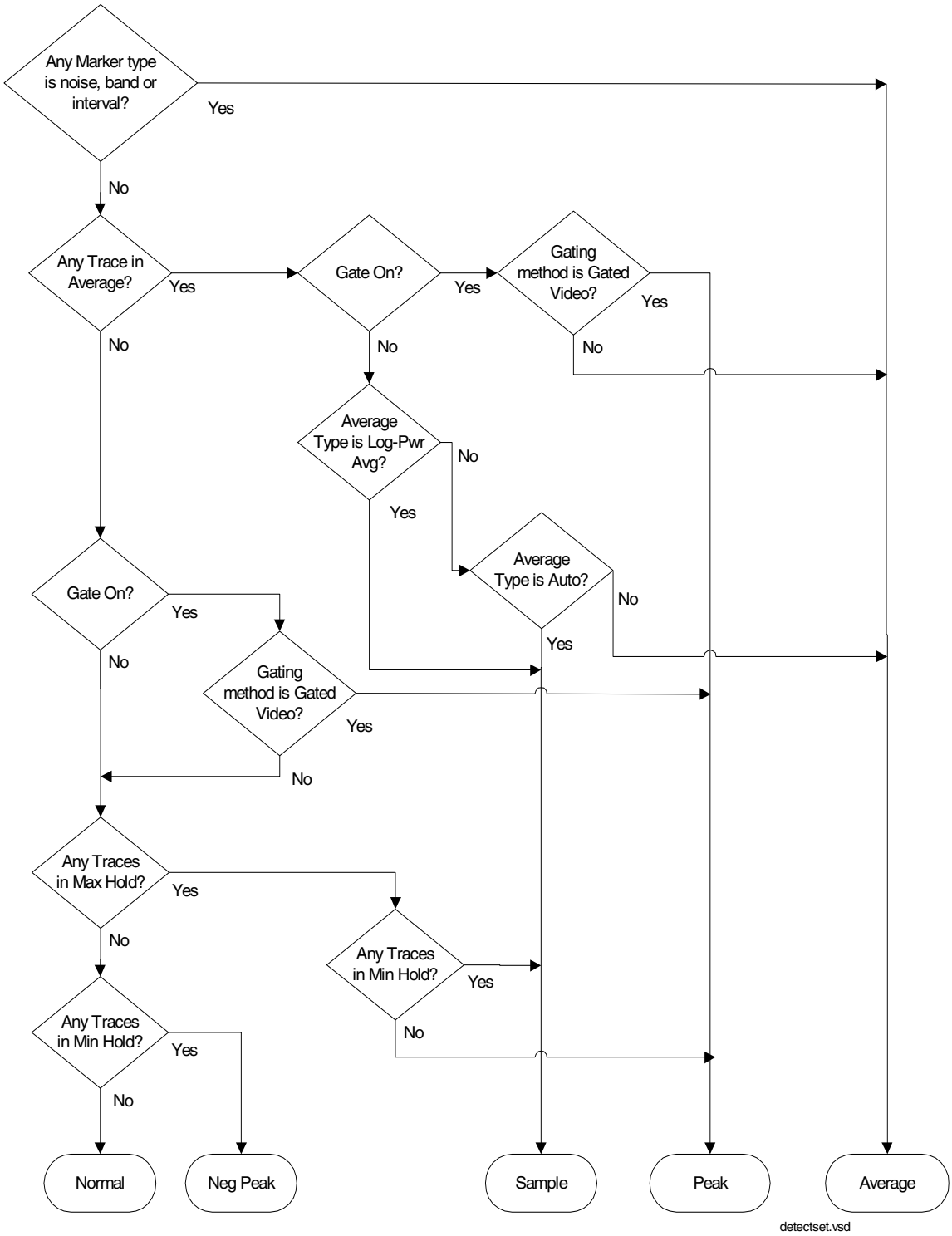


Figure 1 Auto Rules For Detector Selection

Key Path: Det/Demod

Factory Preset: On, Normal

Remote Command:

[:SENSe]:DETector:AUTO OFF|ON|0|1

[:SENSe]:DETector:AUTO?

Example:

DET:AUTO ON

Normal

Displays the peak-detected level in the interval (bucket) being displayed when the signal is CW-like. If the signal is noise-like (within a bucket the signal both rose and fell), the even bucket shows the peak (maximum) within a two-bucket interval, and the odd bucket shows the negative peak (minimum). Gain is increased to compensate for the effects of faster sweep rates, to keep the displayed value of CW signals accurate.

When Normal is selected, “Norm” appears on the left side of the display.

Key Path: Det/Demod >Detector

Remote Command:

See“Detector Auto Manual" on page 106.

Example:

DET NORM

Average

For each interval (bucket) in the trace, Average detection displays the average of all samples within the interval using one of the following averaging methods:

- log (also known as video)
- power (also known as RMS)
- voltage envelope

To explicitly set the averaging method, use the BW/Avg, Avg/VBW Type key. The combination of the average detector and the power method is equivalent to what is sometimes referred to as "RMS detection." When the method (Avg/VBW Type) is set to Pwr Avg, and Detector is set to Average, the RMS method is selected.

When Average is selected, Avg appears on the left side of the display.

Key Path: Det/Demod, Detector

Dependencies/Couplings: Use of Average affects the VBW setting. See the section "Video BW" on page 94. When in Average detection, video trigger (Trig, Trigger, Video) is not available.

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET AVER

Peak

For each interval (bucket) in the trace, Peak detection displays the highest amplitude within the interval. Peak detection is used for CW measurements and some pulsed-RF measurements. For swept analysis, peak detection basically obtains the maximum video signal between the end of the previous bucket and the end of the current one. Gain is increased to compensate for the effects of faster sweep rates, to keep the displayed value accurate. For FFT analysis, the highest spectral amplitude is displayed, even if that peak amplitude falls between samples of the spectrum computed in the FFT process.

When Peak is selected, `Peak` appears on the left side of the display.

Key Path: Det/Demod, Detector

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET POS

Sample

The sample detector displays the instantaneous level of the signal at the center of the interval (bucket) represented by each trace point.

Sample detection is primarily used to display noise or noise-like signals.

Sample detection is not best for amplitude measurements of CW-like signals for two reasons. First, the peak response to a signal can occur between samples, so unless the Span to RBW ratio is lower than usual, the highest sample can be well below the peak signal amplitude. Second, for the high sweep rates normally used, the peak response of the RBW filters is up to –0.5 dB. This sweeping error is compensated when using the peak and normal detectors by changing the overall gain. But the gain is not changed when in the sample detector, because to do so would cause errors in the response to noise.

When Sample is selected, Samp appears on the left side of the display.

Key Path: Det/Demod, Detector

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET SAMP

Negative Peak

For each interval (bucket) in the trace, Negative Peak detection displays the lowest sample within the interval.

When Negative Peak is selected, “NPk” appears on the left side of the display.

Key Path: Det/Demod, Detector

Remote Command:

See“Detector Auto Manual" on page 106.

Example:

DET NEG

Quasi Peak

Selects quasi peak detection. This is a fast-rise, slow-fall detector used in making CISPR compliant EMI measurements. Quasi peak detection displays a weighted amplitude using specific charge, discharge, and meter-movement time constants as described in CISPR Publication 16.

Key Path: Det/Demod, Detector

Dependencies/Couplings: Whenever the quasi peak detector is selected, the resolution bandwidths available will be the CISPR set described in the tables below. If the Auto, FFT & Sweep setting is Manual:FFT Quasi Peak is grayed out.

Table 2 CISPR Bandwidths with RBW Set to Auto

Band	Start Frequency	Stop Frequency	Bandwidth
A	10 kHz	150 kHz	200 Hz
B	150 kHz	30 MHz	9 kHz
C & D	30 MHz	1 GHz	120 kHz

Table 3 CISPR Bandwidths with RBW Set to Manual

RBW, Hz	Type	Equivalent – 3 dB BW Filter
10	– 6 dB	6.8 Hz
30	– 6 dB	20 Hz
100	– 6 dB	68 Hz
200	CISPR	150 Hz
300	– 6 dB	200 Hz
1 k	– 6 dB	680 Hz
3 k	– 6 dB	20 kHz
9 k	CISPR	6.2 kHz
30 k	– 6 dB	20 kHz
120 k	CISPR	75 kHz
300 k	– 6 dB	200 kHz
1 M	CISPR	680 kHz
3 M	– 6 dB	2 MHz
10 M	– 6 dB	8 MHz

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET QPE

EMI Average

Selects EMI averaging detection. EMI Average detection displays the average value of amplitude envelope. It is defined for EMI measurements by the CISPR standard and uses the VBW filter as a low pass filter, the output of which is sampled during the bucket interval. This functionality is quite different from the Average detector.

Key Path: Det/Demod, Detector

Dependencies/Couplings: Whenever the EMI Average detector is selected, the resolution bandwidths available will be the CISPR set listed in Table 2 on page 116 and Table 3 on page 116.

The Video BW is restricted to 1 Hz while VBW is set to Auto.

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET EAV

EMI Peak

Selects peak detection. This is the same detection as the regular Peak detector. The difference is the Auto resolution bandwidths that are available as described in Table 2 on page 116 and Table 3 on page 116.

Key Path: Det/Demod, Detector

Dependencies/Couplings: Whenever the EMI Average detector is selected, the resolution bandwidths available will be the CISPR set listed in Table 2 on page 116 and Table 3 on page 116 and Table 4 on page 120**.** EMI Peak is grayed out if the N8201A is in Manual:FFT mode.

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET EPOS

MIL Peak

Selects peak detection. This is the same detection as the regular Peak detector. The difference is the resolution bandwidths that are available, as shown in Table 4 on page 120 and Table 5 on page 120.

Table 4 MIL Specifications for Bandwidth vs. Frequency with RBW Set to Auto

Start Frequency	Stop Frequency	Bandwidth
30 Hz	1 kHz	10 Hz
1 kHz	10 kHz	100 Hz
10 kHz	150 kHz	1 kHz
150 kHz	30 MHz	10 kHz
30 MHz	1 GHz	100 kHz
1 GHz	Unlimited	1 MHz

Table 5 MIL Bandwidths with RBW Set to Manual

RBW, Hz	Type	Equivalent – 3 dB BW Filter
10	MIL	6.8 Hz
30	– 6 dB	20 Hz
100	MIL	68 Hz
300	– 6 dB	200 Hz
1 k	MIL	680 Hz
3 k	– 6 dB	2 kHz
10 k	MIL	6.8 kHz
30 k	– 6 dB	20 kHz
100 k	MIL	68 kHz
300 k	– 6 dB	200 kHz
1 M	MIL	680 kHz
3 M	– 6 dB	2 MHz
10 M	– 6 dB	8 MHz

Key Path: Det/Demod, Detector

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET MPOS

RMS (Remote Command Only)

Selects the Average Detector. If BW/Avg, Avg/VBW Type is set to Auto (or Pwr Avg) this will yield the RMS voltage (average power) for each trace point. (See "Average" on page 112.)

Key Path: There is no key selection for this setting, but you can access it by using **Average Detector** (see "Average" on page 112).

Remote Command:

See"Detector Auto Manual" on page 106.

Example:

DET RMS

6 Display

Displays menu keys that enable you to control certain items on the display of the Spectrum Analyzer GUI.

Key Path: Front-panel key

Full Screen

When **Full Screen** is pressed the measurement window expands horizontally over the entire instrument display. It turns on/off the display of the softkey labels. Pressing any other key that results in a new menu will cancel the full screen function.

Key Path: Display

State Saved: Not saved in state.

Factory Preset: Off

Factory Default: Off

Remote Command:

```
:DISPlay:FSCReen[:STATe] OFF|ON|0|1
:DISPlay:FSCReen[:STATe]?
```

Example:

```
DISP:FSCR ON
```

Display Line

Activates an adjustable horizontal line that is used as a visual reference line. The line has an amplitude value that corresponds to its vertical position relative to the reference level. The value of the display line appears on the left side of the display below the label `Dl`. The display line can be adjusted using the keyboard. The units of Display Line are determined by the Y-Axis Units setting under Amplitude.

Key Path: Display

State Saved: Saved in Instrument State.

Factory Preset: – 25 dBm, Off

Terminators: dBm, mV, uV

Range: – 370 dBm to 30 dBm

Remote Command:

```
:DISPlay:WINDow:TRACe:Y:DLINe <ampl>
:DISPlay:WINDow:TRACe:Y:DLINe?
:DISPlay:WINDow:TRACe:Y:DLINe:STATe OFF|ON|0|1
:DISPlay:WINDow:TRACe:Y:DLINe:STATe?
```

Example:

```
:DISP:WIND:TRAC:Y:DLIN -32 dBm
:DISP:WIND:TRAC:Y:DLIN:STAT OFF
```

Limits

Limit lines can be defined to compare the data to your defined limits and indicate a pass or fail condition. Limits accesses menus that allow you to create, modify, and change the properties of limit lines. There are two limit lines in the instrument.

Key Path: Display

State Saved: Not saved in instrument state.

Factory Default: Unaffected by system defaults.

Remote Command:

```
:CALCulate:LLINe[1]|2:DATA <x-axis>, <ampl>,
<connected>{,<x-axis>,<ampl>,<connected>}
```

```
:CALCulate:LLINe[1]|2:DATA?
```

Defines the limit line values, and erases all existing data. Up to 200 points may be defined for each limit using the following parameters.

<x-axis> can be frequency or time values as specified by the following command: `:Calculate:LLINe:CONTrol:DOMain`.
Frequencies are always in Hz. Time is always in seconds. No unit is allowed in this parameter.

Range: – 30 Gs to +30 Gs for time limits, – 3 kHz to +350 GHz for frequency limits.

<ampl> amplitude values are always in units of dBm. Up to two amplitude values can be provided for each x-axis value, by repeating <x-axis> in the data list. No unit is allowed in this parameter.

Range: – 140 dBm to +100 dBm

<connected> connected values are either "0" or "1." A "1" means this point should be connected to the previously defined point to define the limit line. A "0" means that it is a point of discontinuity and is not connected to the preceding point. The *connected* value is ignored for the first point.

```
:CALCulate:LLINe[1]|2:DATA:MERGe <x-axis>, <ampl>,
<connected>{,<x-axis>,<ampl>,<connected>}
```

Adds the points with the specified values to the current limit line, allowing you to merge limit line data. Up to two amplitude values are allowed for each x value. If more than 200 points are entered to be merged, the first 200 points are merged into the existing limit, then an error `'too many DATA entries'` is reported.

Remote Command Notes:

Up to 200 points total may be defined for each limit.

Example:

```
CALC:LLIN1:DATA 1000000000, -20,0,200000000,-30,1
```

Limit 1 or Limit 2

Selects Limit 1 or Limit 2 for modification.

Key Path: Display, Limits

State Saved: Not saved in instrument state.

Type (Upper Lower)

Defines the limit you are editing as either an upper or lower limit. An Upper limit fails if the trace exceeds the limit. A Lower limit fails if the trace falls below the limit.

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

Dependencies/Couplings: If a margin has already been set for this limit line, and this key is used to change the limit type, then the margin value is reset to 0 dB.

State Saved: Not saved in instrument state. Survives power cycle and preset. The limit-line data is saved in files.

Factory Default: Limits are off by default. Upper for Limit 1, then a limit line is created. Lower for Limit 2, then a limit line is created.

Remote Command:

```
:CALCulate:LLINe[1]|2:TYPE UPPer|LOWer
```

```
:CALCulate:LLINe[1]|2:TYPE?
```

Example:

```
:CALC:LLIN2:TYPE LOW sets limit line 2 as a lower limit.
```

```
:CALC:LLIN1:TYPE? responds with the limit line 1 limit
type.
```

Limit Display

Turns limit-line display On or Off. Either Limit or Margin, as well as Test, must be turned on to turn on a limit test.

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

State Saved: Not saved in instrument state.

Factory Default: Off (when a limit line is created)

Remote Command:

```
:CALCulate:LLINe[1]|2:DISPlay OFF|ON|0|1
:CALCulate:LLINe[1]|2:DISPlay?
```

Example:

```
:CALC:LLIN2:DISP OFF
:CALC:LLIN1:DISP?
```

Limit Test

Turns the testing of the limit line On or Off. If the trace is at or within the bounds of the set limit or margin, `PASS LIMIT#` or `PASS MARGIN#` is displayed in green in the upper-left corner of the measurement area where # is the number of the selected limit line.

Only positive margins are allowed for lower limits and only negative margins are allowed for upper limits. If the trace is out of the limit or margin boundaries, `FAIL LIMIT#` or `FAIL MARGIN#` is displayed in red. The results for Limit 2 are displayed below those for Limit 1. Either Limit or Margin must be turned on for Test to be turned on.

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

Dependencies/Couplings: If either of the limits or margins are turned off, the test cannot be turned on. That is, if both Limit and Margin are set to Off, then the test is turned off automatically.

State Saved: Not saved in instrument state.

Factory Default: Off (when a limit line is created)

Remote Command:

```
:CALCulate:LLINe[1]|2:STATe OFF|ON|0|1
:CALCulate:LLINe[1]|2:STATe?
:CALCulate:LLINe[1]|2:FAIL?
```

Example:

`:CALC:LLIN:STATE 1` sets limit line 1 test on.

`:CALC:LLIN:STATE?` responds with the limit line test status.

`:CALC:LLIN:FAIL?` Queries the status of the limit-line testing. Returns a "`0`" if the data passes, and returns a "`1`" if there is a failure. This query value is valid only if Margin or Test is On.

Margin (On Off)

Turns margin On or Off. Selecting On allows you to set a limit-line offset for the selected limit line. Only positive margins are allowed for lower limits and only negative margins are allowed for upper limits. The margin lines are displayed in a light gray color. If the limit lines are off and margin is on, the trace is checked against the margin, then a pass or fail margin is displayed. Either Limit or Margin, as well as Test, must be turned on to turn on a limit test.

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

Dependencies/Couplings: If neither of the limits or margins are turned on, the test cannot be turned on. That is, if both Limit and Margin are set to Off, then the test is turned off automatically. If a margin has been set for this limit line, and this key is used to change the limit type, then the margin values is reset to 0 dB.

State Saved: Not saved in instrument state. Survives preset and power cycle.

Factory Default: Off (when a limit line is created). Default value is not affected by a preset.

Resolution: 0.1 dB

Range: 0 to – 40 dB (Upper); 0 to 40 dB (Lower)

Remote Command:

```
:CALCulate:LLINe[1]|2:MARGin:STATe OFF|ON|0|1
:CALCulate:LLINe[1]|2:MARGin:STATe?
```

```
:CALCulate:LLINe[1]|2:MARGin <ampl_rel>
:CALCulate:LLINe[1]|2:MARGin?
```

Edit

Pressing Edit accesses menus for editing limit lines and for accessing the limit-line table editor. Navigation through the limit-line table is achieved by using the keyboard. Entering data in each field navigates to the next field. New limit segments will only be applied after the editor is closed.

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

Point

Up to 200 points may be defined for each limit line using **Point**. A maximum of two different points may be entered that have the same frequency. Enter the point number to be created or edited using the numeric keypad, then press **Enter**, or use the front-panel knob, or step keys to move to an existing point. The step-up key takes you to the next point, while the step-down key takes you to the previous point. After selecting a point, **Frequency** (or **Time**, depending on x-axis selection) becomes active.

Key Path:

```
Display, Limits, Limit 1, Edit
Display, Limits, Limit 2, Edit
```

State Saved: Not affected by state.

Factory Preset and *RST: 1

Factory Default: 1

Terminators: Enter

Default Terminator: Enter

Resolution: 1

Step Key Increment: 1

Range: 1 to 200

Frequency (or Time)

Pressing this key allows you to enter a value for a limit point in frequency (or time). Note that this key label changes to **Time** if **X Axis Units** has been selected. After entering a value, the limit table is sorted to place the value in the correct order. A maximum of two different points may be entered that have the same frequency. For a new point, **Amplitude** defaults to 0 dBm and **Connected** defaults to **Yes**. **Amplitude** then becomes active.

Key Path:

Display, Limits, Limit 1, Edit

Display, Limits, Limit 2, Edit

Dependencies/Couplings: Limit-line points are selected according to the X-axis units selected, for example if frequency is selected as your X-axis units, then the limit points are frequency values. Also, if both upper and lower limit lines are selected for the trace then both need to be defined using the same X-axis units.

Fundamental Units: Hz, s

Factory Preset and *RST: 27 GHz; 0 sec

Terminators: Hz, s

Default Terminator: Hz (frequency), s (time)

Amplitude

Pressing **Amplitude** allows you to enter the amplitude value for the current limit point. After entering a value, **Connected** becomes active. If a front-panel arrow key is pressed without entering a value, the current **Amplitude** and **Connected** values of the point are selected. If the up arrow is pressed, the point number automatically increments to allow entry of the amplitude of the next point. If it is a new point, the **Frequency** may also be entered for the new point.

Key Path:

Display, Limits, Limit 1, Edit

Display, Limits, Limit 2, Edit

Factory Preset and *RST: 0 dBm

Fundamental Units: dBm

Terminators: dBm

Default Terminator: dBm

Resolution: 0.1 dBm

Step Key Increment: 10 dBm

Range: – 140 dBm to 100 dBm

Connected To Previous Pt

A current point may be connected to the previous point by pressing **Yes**. No limit testing is performed between disconnected points. Pressing this key when the Connected field is selected toggles the connected value of the current point and increments the Point number to allow entry or editing of the Frequency of the next point. If an arrow key is pressed without entering a value, the current Connected value of the point is selected. If an arrow key is pressed, the Point number automatically increments to allow entry of the Connected value of the next point. If it is a new point, the **Frequency** may be entered for the new point.

Key Path:

Display, Limits, Limit 1, Edit

Display, Limits, Limit 2, Edit

Factory Preset and *RST: Yes

Step Key Increment: Toggles to other selection

Delete Point

Deleting the current limit point can be achieved by pressing **Delete Point**. You will be prompted with the message `If you are sure, press key again to delete`. Pressing **Delete Point** again will delete the limit point.

Key Path:

Display, Limits, Limit 1, Edit

Display, Limits, Limit 2, Edit

Delete Limit

Deletes the current limit LINE.

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

Factory Preset and *RST: Off

Remote Command:

`:CALCulate:LLINe[1]|2:DELete`

Example:

`:CALC:LLIN:DEL` deletes limit line/margin 1 (LLIN defaults to Limit Line 1)

Freq Interp

This key is grayed out in the time domain (when the N8201A is zero span). Sets the interpolation to linear or logarithmic for the specified limiting points set, allowing you to determine how limit trace values are computed between points in a limit table. The available interpolation modes are linear and logarithmic. If the linear (Lin) mode is used for both frequency and amplitude, a straight line is used when interpolating between points in a limit table. If frequency interpolation is logarithmic (Log), frequency values between limit points are computed by first taking the logarithm of both the table values and the intermediate value. A linear interpolation is then performed in this logarithmic frequency space. An exactly analogous manipulation is done for logarithmic amplitude interpolation.

If two amplitude values are entered for the same frequency, a single vertical line is the result. In this case, if an upper line is chosen, the amplitude of lesser frequency (amplitude 1) is tested. If a lower line is chosen, the amplitude of greater frequency (amplitude 2) is tested.

For linear amplitude interpolation and linear frequency interpolation, the interpolation is computed as: $y = \frac{y_{i+1} - y_i}{f_{i+1} - f_i}(f - f_i) + y_i$

For linear amplitude interpolation and log frequency interpolation, the interpolation is computed as: $y = \frac{y_{i+1} - y_i}{\log f_{i+1} - \log f_i}(\log f - \log f_i) + y_i$

For log amplitude interpolation and linear frequency interpolation, the interpolation is computed as: $\log y = \frac{\log y_{i+1} - \log y_i}{f_{i+1} - f_i}(f - f_i) + \log y_i$

For log amplitude interpolation and log frequency interpolation, the interpolation is computed as: $\log y = \frac{\log y_{i+1} - \log y_i}{\log f_{i+1} - \log f_i}(\log f - \log f_i) + \log y_i$

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

State Saved: Persistent; retains settings, even through a power cycle.

Factory Preset and *RST: Log

Remote Command:

```
:CALCulate:LLINe[1]|2:CONTrol:INTerpolate:TYPE
LOGarithmic|LINear
```

```
:CALCulate:LLINe[1]|2:CONTrol:INTerpolate:TYPE?
```

Example:

`:CALC:LLIN2:CONT:INT:TYPE LIN` sets limit line 2 frequency interpolation to linear.

Amptd Interp

Allows you to determine how limit trace values are computed between points in a limit table. The available interpolation modes are linear (Lin) and logarithmic (Log). If the linear mode is used for both frequency and amplitude, a straight line is used when interpolating between points in a limit table. This function does not work in zero span (when the N8201A is in time domain). Refer to the "Note" in "Freq Interp" on page 133 for more information.

Interpolation modes determine how limit values are computed between points in the limit table. The appearance of a limit trace is also affected by the amplitude scale, which may be linear or logarithmic.

Key Path:

Display, Limits, Limit 1

Display, Limits, Limit 2

State Saved: Persistent; retains settings, even through a power cycle.

Factory Preset and *RST: Not affected by preset

Factory Default: Log for a new limit.

Remote Command:

```
:CALCulate:LLINe[1]|2:AMPLitude:INTerpolate:TYPE
LOGarithmic|LINear
```

```
:CALCulate:LLINe[1]|2:AMPLitude:INTerpolate:TYPE?
```

Example:

`:CALC:LLIN:AMPL:INT:TYPE LOG` sets limit line 1 amplitude interpolation to LOG.

`:CALC:LLIN:AMPL:INT:TYPE?` responds with the limit line interpolation type.

X Axis Units

Selects how the limit-line segments are defined. Pressing X Axis Units selects whether the limit lines will be entered using frequency (Freq) or sweep time (Time) to define the segments. They can be specified as a table of limit-line segments of amplitude versus frequency, or of amplitude versus time. A time value of zero corresponds to the start of the sweep, which is at the left edge of the graticule. Switching the limit-line definition between Freq and Time will erase both of the current limit lines. The following message will appear on screen:

Changing X axis units will delete all limits. If you are sure, press key again to change units.

Changing this setting deletes all existing limit data from the N8201A. In other words, if a limit line has already been defined, changing the units clears the existing limit line.

Press X Axis Units again to purge both limit lines and to switch between frequency and time.

Key Path: Display, Limits

Factory Default: Frequency for a new limit.

Remote Command:

`:CALCulate:LLINe:CONTrol:DOMain FREQuency|TIME`

`:CALCulate:LLINe:CONTrol:DOMain?`

Remote Command Notes: For TIME, the limit line segments are placed on the spectrum analyze display with respect to the sweep time setting of the N8201A, with 0 at the left edge of the display.

For FREQuency, segments are placed according to the frequency that is specified for each segment.

Example:

`:CALC:LLIN:CONT:DOM FREQ` sets limit lines 1 and 2 x-axis units to frequency.

`:CALC:LLIN:CONT:DOM TIME` sets limit lines 1 and 2 x-axis units to time.

`:CALC:LLIN:CONT:DOM?` responds with limit lines 1 and 2 x-axis unit type.

Limits (Fixed Rel)

Specifies whether the current limit lines are fixed or relative.

The fixed (Fixed) type uses the current limit lines as a reference with fixed frequency and amplitude values. The relative (Rel) setting results in the current limit-line value to be relative to the displayed center frequency and reference level amplitude values. When limit

lines are specified with time, rather than frequency, the Rel setting only affects the amplitude values. The current amplitude values will be relative to the displayed reference level amplitude, but the time values will always start at the left edge of the graticule.

For example, assume you have a frequency limit line. If the limit line is specified as fixed (Fixed) entering a limit line segment with a frequency coordinate of 300 MHz displays the limit line segment at 300 MHz. If the same limit line table is specified as relative (Rel), it is displayed relative to the N8201A center frequency and reference level. If the center frequency is at 1.0 GHz, a relative limit line segment with a frequency coordinate of 300 MHz will display the limit line segment at 1.3 GHz. If the amplitude component of the relative limit line segment is –10 dB, the – 10 dB is added to the reference level value to obtain the amplitude of the given segment (reference level offset included).

A limit line entered as Fixed may be changed to Rel, and one entered as Rel may be changed to Fixed. When changing between fixed and relative limit lines, the frequency and amplitude values in the limit line table change so that the limit line remains in the same position for the current frequency and amplitude settings of the N8201A. If a time and amplitude limit line is used, the amplitude values change but the time values remain the same.

Key Path: Display, Limits

Factory Default: Fixed for a new limit.

Remote Command:

If you need to change the domain with `:CALCulate:LLINe:CONTrol:DOMain`, do it before this command. Changing the domain deletes all the existing limit line values.

```
:CALCulate:LLINe:CMODe FIXed|RELative
```

```
:CALCulate:LLINe:CMODe?
```

Example:

```
:CALC:LLIN:CMOD FIX
```

Delete All Limits

Deletes all limit lines. Pressing Delete Limits purges the data from the limit-line tables. Pressing Delete Limits after the prompt, If you are sure, press key again to delete, will delete the limits.

Key Path: `Display, Limits`

Factory Preset and *RST: Not affected by preset.

Remote Command:

```
:CALCulate:LLINe:ALL:DELete
```

Example:

`:CALC:LLIN:ALL:DEL` deletes all of the data points for limits lines 1 and 2.

Active Fctn Position

Selects the screen position for the Active Function Display. Depending on the type of trace date being viewed, you can move the Active Function Display position for less visual interference with your screen data.

Key Path: Display

Readback: The selection of the position to display the active function (Top, Center, Bottom) reads back to line 3 of this key.

State Saved: Not saved in instrument state, survives power cycle and preset.

Factory Preset: No effect, persistent variable, survives power cycle and preset.

Factory Default: Center. Pressing **System**, **Restore Sys Defaults** will reset to factory defaults.

Remote Command:

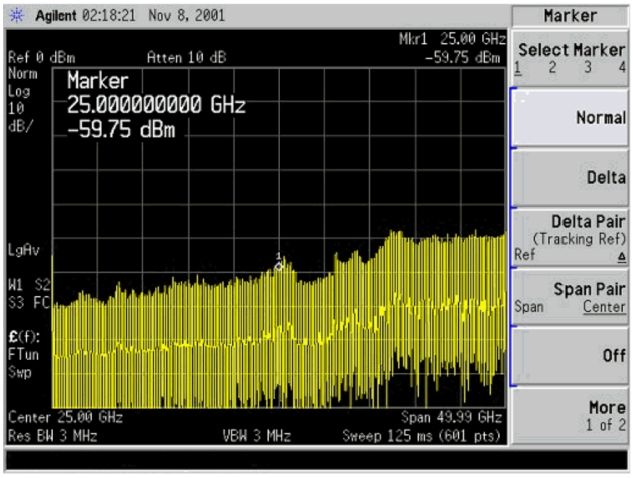
```
:DISPlay:AFUNction:POSition BOTTom|CENTer|TOP
:DISPlay:AFUNction:POSition?
```

Example:

```
:DISP:AFUN:POS BOT
```

Top

Displays the active function in the top-left corner of the display.



Key Path: Display, Active Fctn Position

Readback: `Top` reads back to line 3 of this key.

State Saved: Not saved in instrument state, survives power cycle and preset.

Factory Preset: No effect, persistent variable, survives power cycle and preset.

Factory Default: Center

Remote Command:

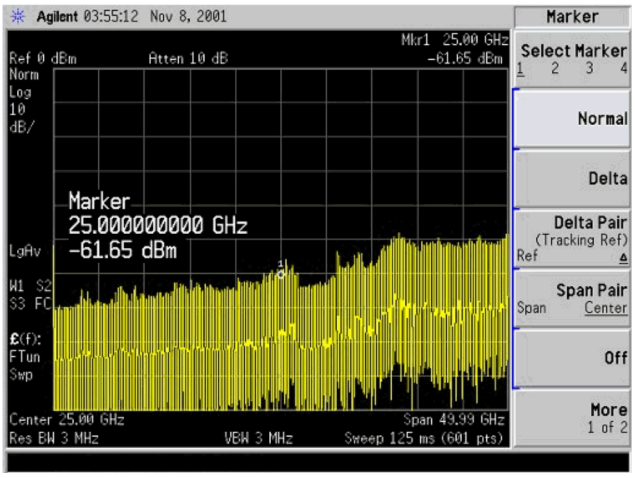
```
:DISPlay:AFUNction:POSition TOP
```

Example:

```
:DISP:AFUN:POS TOP
```

Center

Displays the active function in the center-left side of the display.



Key Path: Display, Active Fctn Position

Readback: `Center` reads back to line 3 of this key.

State Saved: Not saved in instrument state, survives power cycle and preset.

Factory Preset: No effect, persistent variable, survives power cycle and preset.

Factory Default: Center

Remote Command:

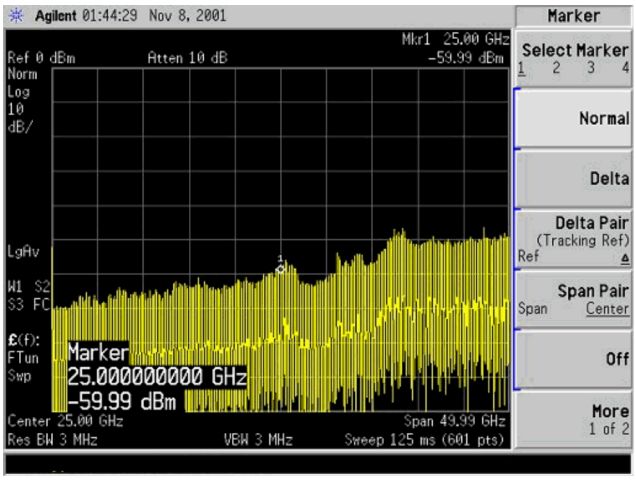
```
:DISPlay:AFUNction:POSition CENTer
```

Example:

```
:DISP:AFUN:POS CENT
```

Bottom

Displays the active function in the bottom-left corner of the display.



Key Path: Display, Active Fctn Position

Readback: `Bottom` reads back to line 3 of this key.

State Saved: Not saved in instrument state, survives power cycle and preset.

Factory Preset: No effect, persistent variable, survives power cycle and preset.

Factory Default: Center

Remote Command:

```
:DISPlay:AFUNction:POSition BOTtom
```

Example:

```
:DISP:AFUN:POS BOT
```

Title

Displays menu keys that enable you to change or clear a title on your display.

Key Path: Display

Change Title

Allows you to write a title across the top of the display. Press **Change Title** to access the Alpha Editor Menus that contain available characters and symbols. You may also use the numeric keypad to enter numbers. Press **Enter** or **Return** to complete the entry. Press **ESC** to cancel the entry and preserve your existing title.

The display title will remain until you press **Change Title** again, or you recall a trace or state, or a **Factory Preset** is performed. A title can also be cleared by pressing **Title**, **Clear Title**.

Pressing this key cancels any active function.

Key Path: Display, Title

State Saved: Saved in Instrument State.

Remote Command:

```
:DISPlay:ANNotation:TITLe:DATA <string>
```

```
:DISPlay:ANNotation:TITLe:DATA?
```

Example:

DISP:ANN:TITL:DATA “This Is My Title”

Clear Title

Allows you to clear a title from the front-panel display. Once cleared, the title cannot be retrieved.

Key Path: Display, Title

Factory Preset: No title

Remote Command:

There is no equivalent command, but the example below shows how to enter an empty title.

Example:

```
DISP:ANN:TITL:DATA "TEST 3"
```

Preferences

Accesses menu keys which allow you to turn the graticule and annotation on or off.

Key Path: Display

State Saved: Saved in Instrument State.

Factory Preset and *RST: No title

Graticule (On Off)

Pressing Graticule turns the display graticules On or Off.

Key Path: Display

Factory Preset and *RST: On

Factory Default: On

Terminators: Enter

7 File

Displays a menu of functions that enable you to load, save, and manage data on the PC's internal drive (C:); you can recall, save, copy, delete, or rename files of instrument states, trace data, and screen captures. The menu keys display dialog boxes appropriate for the selected function.

The MMEMory command syntax term <'file_name'> is a specifier having the form: 'DRIVE:\DIRECTORY\NAME.EXT', where the following rules apply:

- "DRIVE" is "C:"
- "\DIRECTORY\" is the path name.
- "NAME" is a DOS file name of up to eight characters, letters (A-Z, a-z) and numbers (0-9) only.
- "EXT" is an optional file extension using the same rules as "name," but consists of up to three characters total

File Types

You can save the following types of files:

State - A file that contains a copy of the state of the analyzer at the time the file is saved. The settings of most analyzer functions are saved in the state files but not traces, limits, and corrections. When a **State** file is loaded into the analyzer, the analyzer is restored to the same state as when the file was saved. Some settings are not saved in the **State** files, for example the GPIB address; these settings are called "persistent." In this manual, each function describes whether that function is saved in "Instrument State" or is persistent.

Trace - A file that contains a copy of the trace data for one or more traces. There are two formats for trace files, **Trace + State** and **CSV** files.

Trace + State: A file that contains the trace data and a copy of the current analyzer state. The trace and state are stored in an internal data format (TRC), which cannot be loaded into a PC, but can be loaded back into the analyzer. Traces can be loaded individually or as a group. When a **Trace + State** file is loaded into the analyzer the trace data that was on the screen, when saved, is loaded into the analyzer. This enables you to view the trace as it looked when it was saved. Because the state data is also saved, the analyzer settings, including all the annotation on the screen, is restored as well. To preserve the trace data, the traces contained in the saved files are placed in **View** mode (see "Trace/View" on page 511) so that they are not immediately overwritten by new trace data. This means that you can save traces while making a measurement, and later load them back into the analyzer, where you can print them or transfer them to a computer, in CSV format, for analysis. If you wish to compare two saved traces, place traces in view mode before saving them. This prevents the trace from being rewritten based on a state change from subsequent loads.

CSV: A file that contains trace data in comma-separated values format (CSV, standard PC spreadsheet format), to be read into a spreadsheet for analysis. Most spreadsheet programs support CSV format. They cannot be loaded back into the analyzer.

Limits - A file that contains a copy of the analyzer limit sets at the time the file is saved. Limits provide data sets to determine whether a trace has exceeded preset specifications. Limit sets can hold up to 200 points and can only be saved individually. Refer to the **File**, **Save**, **Source** key description, page 154. When you load a **Limits** file into the analyzer, you restore all of the limit sets that were in the instrument at the time of the save.

When loading Limits files, be sure you have selected the appropriate X Axis Units: frequency or time (**Display**, **Limits**, **Properties**, **X Axis Units**). If you are in time X-Axis Units, and you load frequency limits, all current limit line data will be erased and the analyzer will switch to frequency units. The reverse of the this situation also holds true.

Screen - A file that contains an exact representation of the analyzer display at the time it was saved. You cannot extract data from **Screen** files as you can with **Trace** files, but you can print them or include them in other documents; **Screen** files look exactly as the display looked when the file was saved. They cannot be loaded into the analyzer. There are four formats for screen files, **Bitmap** and **Reverse Bitmap**.

Bitmap: A file that contains an exact bit representation of the screen. Stored in Graphics Interchange Format (GIF) format.

Reverse Bitmap: Same as **Bitmap**, but the black display backgrounds are changed to white and the yellow traces are turned to green to preserve printer black ink.

Corrections - A file that contains a copy of the analyzer correction tables at the time the file is saved (CBL, ANT, OTH, AMP). Corrections provide a way to adjust the trace display for preset gain factors (such as for cable loss). A correction set can hold up to 200 points. Pressing **Corrections** activates the **Source** key. Refer to the **File**, **Save**, **Source** key description, page 154. When you load a **Corrections** file into the analyzer, you restore all of the corrections values that were in the instrument at the time of the save.

Measurement Results - A file that contains a copy of the analyzer measurement data that was current at the time the file is saved. Measurement results files are saved in .CSV format (for importing into spreadsheets). When you load a **Measurement Results** file into the analyzer, you restore all of the measurement data that was in the instrument at the time of the save.

Catalog

Displays directories and files located on the selected drive, depending upon the preferences set under the **Type** (page 146) and **Sort** (page 148) keys. **Catalog** displays menus to navigate the drives and to sort and select the files you wish to view.

The internal analyzer "drive" (C:\) is not an actual disk drive, but an area of nonvolatile (flash) memory which is presented as though it were a disk drive.

The internal analyzer "drive" (I:\) is used for instrument firmware and optional measurement personalities. It is not available for data/file storage.

Key Path: File

Remote Command:

```
:MMEMory:CATalog? <dir_name>
```

Remote Command Notes:

Query returns all files in the specified drive\path name.

The return data will be in the format: `<mem_used>,<mem_free>{,<file_listing>}`

Each `<file listing>` indicates the name and size in bytes of one file in the directory list in the form: `"<file_name>, <file_size>"` for example, a file called "SCREN000.GIF" which is 21286 bytes in size, would list as `"SCREN000.GIF,,21286."` Directories are indicated by square brackets, for example `"[MYDIR],,."`

All files are listed, without regard to the preferences selected for the file catalog on the analyzer screen.

If you use lowercase characters, they are converted to uppercase in interpreting catalog commands.

Example:

```
:MMEM:CAT? 'C:\MYDIR\MYMEAS'
```

Type

Allows you to select the desired type of instrument-data files to be displayed. Common types of instrument data files include trace data, limit line data, and amplitude correction data. See "File Types" on page 144 for more information The catalog displays all files (if **Type** is set to **All**) or files of the currently selected file type. All directories are always displayed.

Type	Format	Destination	Extension
State	State		STA
Trace	Trace + state	Trace 1, 2, 3, or all traces	TRC
	Comma separated trace values	Trace 1, 2, 3, or all traces	CSV
Limit	Internal data format		LIM
Screen	Bitmap		GIF
	Reverse bitmap		GIF
Corrections	Internal data format		ANT, CBL, OTH, and AMP
Measurement Results	Comma separated values		CSV

Key Path: File, Catalog

State Saved: Type is not saved in the instrument state

Factory Preset: Type survives **Factory Preset** and `*RST`, but is set to **State** at power on.

Remote Command:

There is no remote command for this key.

All

Displays all files located in the selected directory. If selected, it applies to **Catalog**, **Delete**, **Copy**, and **Rename**.

Key Path: File, Catalog, Type

State

Displays all state files (STA) in the selected directory. State files contain most instrument settings. If selected, it applies to all **File** functions.

Key Path: File, Catalog, Type

Trace

Displays all trace files (TRC and CSV) in the selected directory. If selected, it applies to all **File** functions.

Key Path: File, Catalog, Type

Limits

Displays all limits files (LIM) in the selected directory.

Key Path: File, Catalog, Type

Screen

Displays all screen files (GIF) in the selected directory.

To save a screen file, press **File, Save, Type, Screen**. Then press the front-panel **Return** key to return to the measurement display. You can then press the front-panel **Save** key to save the current image.

Key Path: File, Catalog, Type

Corrections

Displays all correction files (ANT, CBL, OTH, and AMP) in the selected directory.

Key Path: **File**, **Catalog**, **Type**

Sort

Displays the **Sort** menu keys that enable you to view your saved files according to a selected file attribute.The selections include, **By Date**, **By Name**, **By Extension**, **By Size**, and **Order**. **Order** (**Up**) sorts files in ascending order (for example, A,B,C). **Order** (**Down**) sorts files in descending order (for example, C,B,A).

The **Sort** setting applies to all of the **File** functions, except **Save**.

Key Path: File, Catalog

State Saved: The Sort order survives **Preset**, but is not saved in the instrument state.

Remote Command: There is no remote command for this key.

By Date

Sorts and displays the current file catalog by the date of the files.

Key Path: File, Catalog, Sort

By Name

Sorts and displays the current file catalog in alphabetical order of the name of the files.

Key Path: File, Catalog, Sort

By Extension

Sorts and displays the current file catalog, in alphabetical order, by the file extension of the file names (for example: `.TRC`, `.STA`).

Key Path: File, Catalog, Sort

By Size

Sorts and displays the current file catalog by the size of the files.

Key Path: File, Catalog, Sort

Order

Changes the order of the display of the current file catalog. **Up** sorts the files in ascending order (A to Z, 1 to 9), while **Down** sorts in descending order (Z to A, 9 to 1).

Key Path: File, Catalog, Sort

Dir Up

Moves up one subdirectory level within a directory. If your position is in the top level of the drive already, it moves up to the drive level and the current drive is highlighted (A: or C:).

Key Path: File, Catalog

Dir Select

Selects the drive or directory that is highlighted on the display. You can use the up and down arrows to select and highlight the desired drive or directory. If the top entry in the catalog has a "**. .**" indication, you are in a subdirectory, and this key acts the same as the **Dir Up** key. When you are at the top directory level, this key moves up to the drive level.

Key Path: File, Catalog

Save

Displays menu keys that enable you to save files to the floppy (A:) or internal (C:) drive.

The menus allow you to fill in data-entry fields for file name, type, format, source, and path (directory). Some fields may be blank depending on file type.

The catalog list box is active and can be used for selecting the directory in which to save the file. Saved files that match the current **Type** and **Format** are shown. The **Sort Order** is always **Down**, **By Date**.

Never remove the floppy disk during a save operation. To do so could corrupt *all* data on the floppy disk.

Saving directly to floppy drive A:\ can be slow. Try saving first to internal drive C:\ and then transfer the file to the floppy drive.

Many errors can be generated by a bad **Save** operation. For this reason, if an `'Unable to Save file'` message is seen, you should check the error queue (**System**, **Show Errors**) for the source of the error.

You can press the front-panel **Save** key to immediately save a file using an automatically generated file name. The current **Save** parameters will be used, as though **Save Now** had been pressed.

If saving a **Screen**, the screen saved is the screen that was displayed before pressing **File**. For this reason, the screens seen while in the **File** menus cannot be saved.

Key Path: File

Factory Preset: State is the default file type at power on.

Save Now

Executes the save function. While the file is being saved the popup message `"Saving file"` followed by `"Reading directory"` is displayed. After a successful save, the text message "`xxxxxx file saved`" (where xxxxxx is the file name) appears in the status line. Once you have used the **File**, **Save**, **Save Now** keys to setup and save a file, the **Save** hardkey will perform an immediate **Save Now** of your file in the same format and to the same location.

The analyzer will pick a filename for you based on the table below. `The ###` in the auto-generated file name represents a three-digit number which the analyzer has chosen to be the lowest number in the current sequence that does not conflict with an existing file name. The number starts at `000` with a new analyzer or after the installation of new firmware and counts up with each attempted Save. After a **Restore Sys Defaults,** the number will start at a number that may be lower then the lowest number of the file the currently saved files. The number counts up with each attempted **Save**, but will skip the numbers already in use and not over write existing files. If you want to enter your own file name, refer to **Name** (page 155) for additional information.

Type	Auto-Generated File Name	Extension
State	STATE###	.STA
Trace	TRACE###	.TRC or .CSV
Screen	SCREN###	.GIF

Never remove the floppy disk during a save operation. To do so could corrupt *all* data on the floppy disk.

Many errors can be generated by a bad **Save** operation. For this reason, if an 'Unable to Save file' message is seen, you should check the error queue (**System**, **Show Errors**) for the source of the error.

You are always safe pressing **Save Now** without entering a file name, because the auto-generated file name never conflicts with an existing file.

If the Path: field above the directory box is empty when pressing **Save Now**, the status line will display the error message: Unable to save file, invalid path. In this case, please select a drive.

Key Path: File, Save

Remote Command:

```
:MMEMory:STORe:SCReen <'file_name'>
```

```
:MMEMory:STORe:STATe 1,<'file_name'>
```

The MMEM:STOR:STAT command only saves the state of the Signal Analysis mode. Use *SAV to save all mode states.

```
:MMEMory:STORe:TRACe <label>,<'file_name'>
```

This command is not available when you are outside the Spectrum Analysis mode and working in optional measurement modes.

```
:MMEMory:STORe:LIMit LLINE1|LLINE2,<'file_name'>
```

```
:MMEMory:STORe:CORRection
ANTenna|CABLe|OTHer|USER,<'file_name'>
```

```
:MMEMory:STORe:RESults <'file_name'>
```

```
*SAV <register#>
```

Remote Command Notes:

For the MMEM:STOR:TRAC <label>,<"file_name"> command:

Trace labels are: TRACE1 | TRACE2 | TRACE3 | ALL

The file name must have a file extension of .TRC or .CSV. The file extension determines whether a trace is stored (.CSV), or a trace with its state (.TRC), are stored.

`The <'file_name'>` must include the complete path, for example `'C:\MYTRACE.TRC'`. Lowercase characters are interpreted as uppercase.

These commands will fail if the **<'file_name'>** already exists.

For the `MMEM:STOR:LIM LLINE2,"C:mylimit.lim"` command, there is no short form for parameters `LLINE1|LLINE2`.

Example:

`MMEM:STOR:STAT 1,'C:\mystate.sta'` saves the current instrument state to the specified file name. The .sta extension is required.

`*SAV` saves the current instrument state to a file name `REGxxx`, where `xxx` = the register number. The available register numbers are 0 to 127.

`MMEM:STOR:SCR 'C:\myscreen.gif'` The file must have a .gif file extension. The specified file extension determines which file format the instrument will use to save the image. Only **Bitmap** is available (not **Reverse Bitmap**).

`MMEM:STOR:TRAC TRACE3,'C:\mytrace.trc'` Saves trace 3 to the trace + state file `C:\MYTRACE.TRC`

`MMEM:STOR:CORR ANT, 'A:TEST1.AMP'` saves the current antenna correction to the specified file name. The .amp extension is required.

`MMEM:STOR:LIM LLINE2,'C:mylimit.lim'` saves the current limit line two data set to the specified file name. The .lim extension is required.

`MMEM:STOR:RES 'A:ACP.CSV'` saves the current ACP measurement results to the specified file name. The .csv extension is required.

Type

Allows you to select the type of data you want to save. The file types available for saving are described below. See "File Types" on page 144 and "Type" on page 146 for more information.

Type	Format	Source	Extension
State	State		STA
Trace	Trace + state	Trace 1, 2, 3, or all traces	TRC
	Comma separated trace values	Trace 1, 2, 3, or all traces	CSV
Limit	Internal data format		LIM
Screen	Bitmap		GIF
	Reverse bitmap		GIF

Type	Format	Source	Extension
Corrections	Internal data format		ANT, CBL, OTH, and AMP
Measurement Results	Comma separated values		CSV

All is not an option in **Save**, you have to specify the desired file type.

Key Path: File, Save

State Saved: Type is not saved in the instrument state

Factory Preset: Type survives **Factory Preset** and *RST, but is set to **State** at power on.

Format

When **Type** is set to **Trace**, **Format** allows you to choose between **Trace + State** and **CSV** formats. For more information on file types, refer to "File Types" on page 144.

When **Type** is set to **Screen**, **Format** allows you to choose between **Bitmap** and **Reverse Bitmap** formats. For more information on file types, refer to "File Types" on page 144.

Key Path: File, Save

State Saved: **Format** is not saved in Instrument State.

Factory Preset: **Format** survives **Factory Preset** and *RST, but:

Trace file format is **Trace + State** at power on.

Screen file format is **Bitmap** at power on.

Trace + State

When the file type is **Trace**, this key selects the **Trace + State**, instrument-readable file (TRC) format for your file. For more information on file types, refer to "File Types" on page 144.

Key Path: File, Save, Format

CSV

When the file type is **Trace**, this key selects the trace data as comma-separated values (CSV). The **CSV** format is readable by a spreadsheet on your computer, but the trace cannot be restored to the analyzer display. For more information on file types, refer to "File Types" on page 144.

Key Path: File, Save, Format

Bitmap

When the file type is **Screen**, this key selects the bitmap Graphics Interchange Format (GIF) file format for your saved data. For more information on file types, refer to "File Types" on page 144.

Key Path: File, Save, Format

Reverse Bitmap

When the file type is **Screen**, this key selects the inverse bitmap file format (GIF) for your saved data. For more information on file types, refer to "File Types" on page 144.

Key Path: File, Save, Format

Source

When the file type is set to **Trace**, this key allows you to save trace **1**, **2**, **3** or **All**. Saving trace **All** saves all traces in a single **.** TRC file.

When the file type is set to **Corrections**, **Source** accesses the **Antenna**, **Cable**, **Other** and **User** menu keys, which allow you to select the type of correction to be saved.

When the file type is set to **Limits**, **Source** accesses the **Limit 1** and **Limit 2** menu keys. **Limit 1** and **Limit 2** provide data sets to determine whether a trace has exceeded preset specifications. Limit sets can hold up to 200 points and can only be saved individually.

For any other Save type, **Source** is unavailable (grayed out).

Key Path: File, Save

State Saved: **Source** is not saved in Instrument State.

Factory Preset: **Source** survives **Factory Preset** and *RST, but is set to **All Traces** at power up.

Trace 1

Selects trace 1 to be saved.

Key Path: File, Save, Source

Trace 2

Selects trace 2 to be saved.

Key Path: File, Save, Source

Trace 3

Selects trace 3 to be saved.

Key Path: File, Save, Source

All Traces

Selects all the traces to be saved.

Key Path: File, Save, Source

Name

Displays the Alpha Editor and enables you to enter a filename. The numeric keypad can also be used while entering file names. Press **Enter** or **Return** to complete the name entry.

Only capital letters (A-Z) and digits (0-9) may appear in file names (8 characters, maximum). Additionally, file names include a 3 digit extension which is automatically set by the instrument depending on the file type and format.

Key Path: File, Save

Remote Command: The file name is entered as part of the directory path name that is sent with the SCPI command. See "Save Now" on page 150.

Dir Up

Moves up one subdirectory level within a directory. If your position is in the top level of the drive already, it moves up to the drive level and the current drive is highlighted (A: or C:).

Key Path: File, Save

Remote Command: The directory is entered as part of the directory path name that is sent with the SCPI command. See "Save Now" on page 150.

Dir Select

Displays the highlighted directory. See "Dir Select" on page 155 for more information.

Key Path: File, Save

Remote Command: The directory is entered as part of the directory path name that is sent with the SCPI command. See "Save Now" on page 150.

Load

Displays the menu key that enables you to load instrument-data files from the selected drive and directory back into the instrument. This function displays the file list box, which shows the data-entry fields for the file name, type, destination, and path.

The catalog list box is active and can be used for selecting the file information in the data-entry fields. Only loadable files that match the current type are shown. Placing the cursor on a file name causes it to be loaded into the file name field.

Key Path: File

Load Now

Loads the currently selected file. Displayed settings include name, type, destination, and path. While the file is being loaded a popup message is displayed "`Loading file`." After a successful load, the text message "`xxxxxx file loaded`" (where xxxxxx is the file name) appears in the status line. When traces are loaded they always load in **View** mode.

Traces save in TRC format can be loaded individually or as a group. When a trace is loaded, the state that existed when that trace was saved is loaded along with the trace. Also, the loaded trace(s) is/are placed in view mode.

To compare two saved traces from different saves, place traces in view mode before saving them. This prevents the trace from being rewritten based on a state change from subsequent loads.

Key Path: File, Load

Remote Command:

`:MMEMory:LOAD:STATe 1,<'file_name'>` loads the specified state file into the current active state of the instrument.

The `MMEM:LOAD:STAT` command only saves the state of the Signal Analysis mode. Use `*RCL` to load all mode states. `*RCL <register#>` loads the state from the specified internal register into the current active state of the instrument. The available register numbers are 0 to 127.

```
:MMEMory:LOAD:TRACe <label>,<'file_name'>
```

```
:MMEMory:LOAD:CORRection
ANTenna|CABLe|OTHer|USER,<'file_name'>
```

```
:MMEMory:LOAD:LIMit LLINE1|LLINE2,<'file_name'>
```

Remote Command Notes:

For the `MMEM:LOAD:TRAC <'file_name'>` command, `<'file_name'>` must include the following:

- Complete path
- A file extension of TRC
- Use all uppercase letters.
- Trace labels are: `TRACE1 | TRACE2 | TRACE3`

For the `MMEM:LOAD:STAT 1` command:

- If the firmware revision of the state being loaded is newer than the firmware revision of the instrument, no state is recalled and an error is reported.
- If the firmware revision of the state being loaded is the same as the firmware revision of the instrument, all settings of the state will be loaded.
- If the firmware revision of the state being loaded is older than the firmware revision of the instrument, the instrument will only load the older settings of the state.

Example:

`MMEM:LOAD:STAT 1,'C:MYSTATE.STA'` loads the state file `C:\MYSTATE.STA`.

`MMEM:LOAD:TRAC TRACE3,'C:MYTRACE.TRC'` loads the trace in file `C:\MYTRACE.TRC into trace 3`.

Type

Enables you to select the type of file you want to load. See "File Types" on page 144 and "Type" on page 146 for more information.

The file types available for loading are described in the following table:

Type	Format	Destination	Extension
State	State		STA
Trace	Trace + state	Trace 1, 2, 3, or all traces	TRC
	Comma separated trace values	Trace 1, 2, 3, or all traces	CSV
Limit	Internal data format		LIM
Corrections	Internal data format		ANT, CBL, OTH, and AMP

All is not a file type option in Load. You have to specify the desired file type.

Key Path: File, Load

Sort

Allows you to view saved files according to a selected file attribute. See "Sort" on page 148 for more information.

Key Path: File, Load

Destination

When **Type** is set to **Trace**, **Destination** allows you to direct your data to **Trace 1**, **Trace 2**, or **Trace 3** for a single-trace file. If the data is for all three traces (**Source** was **All** when they were saved), the data will be returned to the original trace registers, regardless of the **Destination** setting.

When **Type** is set to **Limits**, **Destination** allows you to direct your data to **Limit 1** or **Limit 2**.

Key Path: File, Load

State Saved: Not saved in Instrument State.

Factory Preset: Trace file format, is All Traces at power on.

Trace 1

Selects trace 1 for the trace data to be loaded into.

Key Path: File, Load, Destination

State Saved: Not saved in Instrument State.

Factory Preset: Not affected by **Preset**. Power up and **Restore Sys Defaults** sets **Trace 1**.

Trace 2

Selects trace 2 for the trace data to be loaded into.

Key Path: File, Load, Destination

State Saved: Not saved in Instrument State.

Factory Preset: Not affected by **Preset**. Power up and **Restore Sys Defaults** sets **Trace 1**.

Trace 3

Selects trace 3 for the trace data to be loaded into.

Key Path: File, Load, Destination

State Saved: Not saved in Instrument State.

Factory Preset: Not affected by **Preset**. Power up and **Restore Sys Defaults** sets **Trace 1**.

Dir Up

Moves up one subdirectory level within a directory. If your position is in the top level of the drive already, it moves up to the drive level and the current drive is highlighted (A: or C:).

Key Path: File, Load

State Saved: Not saved in Instrument State.

Factory Preset: Trace file format, is All Traces at power on.

Dir Select

Displays the highlighted directory. See “Dir Select" on page 149 for more information.

Key Path: File, Load

State Saved: Not saved in Instrument State.

Factory Preset: Trace file format, is All Traces at power on.

Delete

Displays the **Delete** menu keys that enable you to delete instrument data files from the selected directory. The catalog list box is active and can be used for selecting file information for the data-entry fields. Only files that match the current type are shown. Placing the cursor on a file name causes it to be loaded into the file name field.

Key Path: File

Delete Now

Executes the delete function. After you select the file or directory you want to delete, press **Delete Now** to perform the delete. While the file is being deleted, the popup message `"Deleting file"` followed by `"Reading directory"` are displayed. After a successful deletion, the text message `"xxxxxx file deleted"` (where xxxxxx is the file name) appears in the status line.

If you select a directory or subdirectory to delete, the following popup message is displayed `"WARNING: You are about to delete all of the contents of directory xxxxxx. Press Delete Now again to proceed or any other key to abort."` (xxxxxx is the full path and directory name).

To quickly delete all of the files in a directory, select the file at the top of the list and press **Delete Now** repeatedly until all the files are deleted.

Key Path: File, Delete

Remote Command:

`:MMEMory:DELete <'file_name'>` deletes a file.

`:MMEMory:RDIRectory <'directory_name'>` deletes a directory.

Remote Command Notes:

If `<'file_name'>` does not exist, a `"File Name Error"` occurs.

`<'file_name'>` and `<'directory_name'>` must include the complete path. Lowercase characters are read as uppercase.

Example:

`MMEM:DEL 'C:\destinat.trc'` removes the file `C:\DESTINAT.TRC`.

`MMEM:RDIR 'C:\myDir'` removes directory `C:\MYDIR` and all files and subdirectories within that directory.

Type

Allows you to select the type of file you want to delete. See “File Types" on page 144 and “Type" on page 146 for more information.

Common types of instrument data files include trace data, limit line data, and amplitude correction data. The catalog displays all files, if **Type** is set to **All** or files of the currently selected file type. All directories are always displayed.

Key Path: File, Delete

Sort

Allows you to view your saved files according to a selected file attribute. See “Sort" on page 148 for more information.

Key Path: File, Delete

Dir Up

Moves up one subdirectory level within a directory. If your position is in the top level of the drive already, it moves up to the drive level and the current drive is highlighted (A: or C:).

Key Path: File, Delete

Dir Select

Displays the highlighted directory. See “Dir Select" on page 149 for more information.

Key Path: File, Delete

Copy

Displays the functions to copy instrument data files in the selected directory to the directory and file name that you choose. This key also displays a catalog of the files that are currently saved in the selected directory and data-entry fields for the following: file name, type, and path location.

Key Path: File

Copy Now

Executes the copy function, coping data files from one directory to another on one or more mass storage devices, using the currently displayed file settings. While the file is being copied, the "Copying file" followed by "Reading directory" popup message is displayed. After a successful copy, the green text message "xxxxxx file copied" (where xxxxxx is the file name) appears in the status line. If a copy is being done for a file that already exists in the "To" directory, the text message "File already exists" appears in the status line.

Key Path: File, Copy

Remote Command:

```
:MMEMory:COPY <'file_name1'>,<'file_name2'>
```

Remote Command Notes:

The file names must include the complete file paths. Lowercase characters are read as uppercase.

The original file is <"file_name1">, and the new copy of the file is <"file_name2">.

Example:

`:MMEM:COPY 'C:\oldname.sta','A:\newname.sta'` copies `C:\OLDNAME.STA to A:\NEWNAME.STA`.

Type

Enables you to select the type of file you want to copy. See "File Types" on page 144 and "Type" on page 146 for more information. If **Type** is set to **All**, the catalog displays all files, otherwise the files of the currently selected file type are displayed. All directories are always displayed.

Type	Format	Extension
State	State	STA

Type	Format	Extension
Trace	Trace + state	TRC
	Comma separated trace values	CSV
Limit	Internal data format	LIM
Screen	Bitmap	GIF
	Reverse bitmap	GIF
Corrections	Internal data format	ANT, CBL, OTH, and AMP
Measurement Results	Comma separated values	CSV

Key Path: File, Copy

Sort

Allows you to view your saved files according to a selected file attribute. See "Sort" on page 148 for more information.

Key Path: File, Copy

Dir From/To

Allows you to select the source and destination directories for your copy on one or more drives. When you press **Dir From/To**, it toggles between the two displayed directory list windows. Allowing you to define the "From" and "To" locations for copying.

Key Path: File, Copy

State Saved: Powers up with `C:\` as both the "From" and "To" drives. Not saved in state. Survives **Factory Preset**.

Dir Up

Moves up one subdirectory level within a directory. If your position is in the top level of the drive already, it moves up to the drive level and the current drive is highlighted (C:).

Key Path: File, Copy

Dir Select

Displays the highlighted directory. See "Dir Select" on page 149 for more information.

Key Path: File, Copy

Rename

Allows you to rename a file. The catalog list box is active and can be used for selecting both the path and a file name. Only loadable files that match the current type are shown. Placing the cursor on a file name causes it to be loaded into the file name field.

Key Path: File

Rename Now

Executes the rename function. When the rename is complete, the message `XXXXXX file renamed to YYYYYY` (where `XXXXXX` and `YYYYYY` are the filenames) will appear in the status line on your display. If you try to rename a file with a name that already exists, the text message `(File already exists)` appears in the status line. Placing the cursor on a file name causes it to be loaded into the file name field.

Key Path: File, Rename

Remote Command:

```
:MMEMory:MOVE <'file_name1'>,<'file_name2'>
```

Remote Command Notes:

`<'file_name1'>` must include the complete path, and the case *must* match that of the file to be renamed. `<'file_name2'>` must contain the complete path of the destination, and the case of any directories in the path *must* match those of the directories in the destination path. The case of the destination file name is always interpreted as uppercase.

You can use this command to move files between directories and drives, even though there is no way to do this from the front panel.

Example:

```
MMEM:MOVE 'C:\STATE001.STA','C:\FREQ.STA'
```

Type

Enables you to select the type of file you want to rename. See “File Types" on page 144 and “Type" on page 146 for more information.

If **Type** is set to **All**, the catalog displays all files, otherwise the files of the currently selected file type are displayed. All directories are always displayed.

Type	Format	Extension
State	State	STA
Trace	Trace + state	TRC
	Comma separated trace values	CSV
Limit	Internal data format	LIM
Screen	Bitmap	GIF
	Reverse bitmap	GIF
Corrections	Internal data format	ANT, CBL, OTH, and AMP
Measurement Results	Comma separated values	CSV

Key Path: File, Rename

Sort

Allows you to view your saved files according to a selected file attribute. See “Sort" on page 148 for more information.

Key Path: File, Rename

Name

Displays the Alpha Editor and enables you to enter the file name you want to rename the file to. The numeric keypad can also be used to enter a filename while the alpha editor is accessed. Complete your entry by pressing **Return** or **Enter**. See “Name" on page 155 for more information.

Only capital letters (A-Z) and digits (0-9) may appear in file names (8 characters, maximum). Additionally, file names include a 3 digit extension that is automatically set by the instrument.

Key Path: File, Rename

Dir Up

Moves up one subdirectory level within a directory. If your position is in the top level of the drive already, it moves up to the drive level and the current drive is highlighted (A: or C:).

Key Path: File, Rename

Dir Select

Displays the highlighted directory. See “Dir Select" on page 155 for more information.

Key Path: File, Rename

Create Dir

Displays the functions to create a new subdirectory in the currently selected directory.

Key Path: File

Create Dir Now

Executes the create a new directory function. While the directory is being created a popup message is displayed `"Creating directory"` followed by `"Reading directory."` After the successful creation of a directory, the text message `"Directory xxxxxx created"` (where xxxxxx is the new directory name) appears in the status line. If the creation of a new directory is being performed for a directory name that already exists, the text message "Directory already exists" appears in the status line.

Key Path: File, Create Dir

Remote Command:

:MMEMory:MDIRectory <'dir_name'>

Remote Command Notes:

`<'dir_name'>` must contain the complete path for the new directory. Lowercase characters are interpreted as uppercase.

Example:

`MMEM:MDIR 'C:\myDir'` creates directory `MYDIR` on the `C:\` drive.

Name

Displays the Alpha Editor and enables you to enter a directory name. The numeric keypad can also be used to enter a directory name while the alpha editor is accessed. To complete the entry, press **Return** or **Enter**.

Only capital letters (A-Z) and digits (0-9) may appear in directory names (8 characters, maximum).

Key Path: File, Create Dir

Dir Up

Moves up one subdirectory level within a directory. If your position is in the top level of the drive already, it moves up to the drive level and the current drive is highlighted (A: or C:).

Key Path: File, Create Dir

Dir Select

Displays the highlighted directory. See “Dir Select" on page 155 for more information.

Key Path: File, Create Dir

Delete All

Deletes all the files on a floppy disk; any information on the disk will be destroyed.

Key Type: Branch

Key Notes:

This key displays the file manager display form which includes data entry fields for the new drive name and path.

There is another definition of Format key that defines the format (file type) of you data that you want to save.

Remote Command:

There is no remote command for this key.

Delete All Now

Executes the **Delete All** function. After pressing **Delete All**, the following message will appear on the display: `WARNING: You are about to destroy ALL data on volume A: Press Delete All again to proceed or any other key to abort.` While deleting, a popup message is displayed `"Deleting All."` After a successful floppy disk file deletion, the green text message `"Volume A: delete complete"`, appears in the status line.

Key Path: File, Delete All

Remote Command:

There is no remote command for this key.

Query Trace Data (Remote Command Only)

This command queries trace data from the specified trace. The data format is set by the command :FORMat [:TRACe][:DATA]. When ASCII format is selected, the data is comma-separated ASCII values. Real or Integer format uses a definite length block of data.

The number of trace points returned is set by [:SENSE]:SWE:POIN (from 101 to 8192).

Remote Command:

:TRACe[:DATA]? TRACE1|TRACE2|TRACE3|LLINE1|LLINE2

Remote Command Notes:

Commands :MMEM:STOR:TRAC and :MMEM:LOAD:TRAC are used to transfer trace data to, or from, the internal hard drive or floppy drive of the instrument.

The query returns the current values of the designated trace. The data is terminated with <NL><END> (for GPIB that is newline, or linefeed, followed by EOI set true.)

Example:

```
TRAC:DATA? TRACE1
```

Move Data to a File (Remote Command Only)

This command loads a block of data in the format <definite_length_block> into the instrument memory location <'file_name'>. The query form of the command returns the contents of the file identified by <'file_name'>, in the format of a definite length block of data. The query can be used for copying files out of the analyzer over the remote bus.

A definite length block of data starts with an ASCII header that begins with # and indicates how many additional data points are following in the block. If the header is #512320:

The first digit in the header (5) tells you how many additional digits/bytes there are in the header.

The 12320 means 12,320 data bytes follow the header.

Divide this number of bytes by your selected data format bytes/point, either 8 (for real 64), or 4 (for real 32). In this example, if you are using real 64 then there are 1540 points in the block.

Remote Command:

```
:MMEMory:DATA <'file_name'>,<definite_length_block>
```

```
:MMEMory:DATA? <'file_name'>
```

Example:

`MMEM:DATA 'C:\DEST.TXT','#14abcd'` Loads the data "abcd" into `C:\DEST.TXT`.

`MMEM:DATA? 'C:\SCREN001.GIF'` Initiates a transfer of data from file `C:\SCREN001.GIF`.

Set Data Byte Order (Remote Command Only)

This command selects the binary data byte order for data transfer. It controls whether binary data is transferred in normal or swapped mode. Normal mode is when the byte sequence begins with the most significant byte (MSB) first, and ends with the least significant byte (LSB) last in the sequence: 1|2|3|4. Swapped mode is when the byte sequence begins with the LSB first, and ends with the MSB last in the sequence: 4|3|2|1.

State Saved: Survives **Preset** but not power cycle. Not saved in Instrument State.

Factory Preset: Normal

Remote Command:

```
:FORMat:BORDer NORMal|SWAPped
```

```
:FORMat:BORDer?
```

Example:

```
FORM:BORD SWAP
```

Format Numeric Data (Remote Command Only)

This command changes the format of the data. It specifies the format used for trace data during data transfer across any remote port. REAL and ASCII formats will format trace data in the current amplitude units. The format of state data cannot be changed. It is always in a machine readable format only.

One-button measurement functions only support Binary Real 32, Binary Real 64, and ASCII data formats.

When in Spectrum Analysis mode using older instrument firmware, you were only allowed to change the format of trace type data that was returned using TRACe[:DATA]. With this old firmware, other types of measurement data was only available in the ASCII format. (That is, data returned using FETCh, MEASure and READ commands while in Signal Analysis mode.)

For corrected trace data (`:TRACe[:DATA]` with parameter `<trace_name>`), REAL and ASCII formats will provide trace data in the current amplitude units. INTeger format will provide trace data in mdBm. The fastest mode is INTeger,32. However, some measurement data will not fit in 32-bit integers.

ASCII - Amplitude values are in amplitude units separated by commas. ASCII format requires more memory than the binary formats. Handling large amounts of this type of data takes more time and storage space.

Integer,32 - Binary 32-bit integer values in internal units (dBm), in a finite length block.

Real,32 (or 64) - Binary 32-bit (or 64-bit) real values in amplitude units, in a finite length block. Transfers of real data are done in a binary block format.

A finite length block of data starts with an ASCII header that begins with # and indicates how many additional data points are following in the block. Suppose the header is #512320:

The first digit in the header (5) tells you how many additional digits/bytes there are in the header.

The 12320 means that 12,320 data bytes follow the header.

Divide this number of bytes by your selected data format bytes/point, either 8 (for real 64), or 4 (for real 32). In this example, if you are using real 64 then there are 1540 data points in the block.

State Saved: Saved in Instrument State.

Factory Preset: Survives Preset but not power cycle. Powers up in ASCII format.

Remote Command:

```
:FORMat[:TRACe][:DATA] ASCii|INTeger,32|REAL,32|REAL,64
```

```
:FORMat[:TRACe][:DATA]?
```

Remote Command Notes:

Corrected Trace Data Types for :TRACe:DATA?<trace_name>	
Data Type	Result
ASCii	Amplitude Units
INTeger,32 (fastest)	Internal Units
REAL,32	Amplitude Units
REAL,64	Amplitude Units

Example:

```
FORM REAL,32
```

8 Frequency / Channel

Displays the menu of frequency functions. Depending on the Frequency entry mode, either the center frequency or the start and stop frequency values appear below the graticule on the display. In Center/Span mode, the Center Frequency and Span appear, and the Center Freq function is automatically activated. In Start/Stop mode, the Start and Stop frequencies appear, and the Start Freq function is automatically activated.

Although the N8201A allows entry of frequencies greater than its specified range, N8201A performance will be degraded if it is used beyond the specified frequency range.

Center Freq

Activates the function that sets the center of the displayed frequency range to the specified frequency.

Key Path: FREQUENCY

Annunciation/Annotation: Center <value> appears in the lower left corner of the display.

Dependencies/Couplings: Center frequency and span are coupled to each other.

State Saved: Saved in Instrument State.

Factory Preset: 13.255 GHz

Range: –100 MHz to 27 GHz (with a frequency offset of 0 Hz)

Remote Command:

`[:SENSe]:FREQuency:CENTer <frequency>|UP|DOWN`

`[:SENSe]:FREQuency:CENTer?`

Example:

`FREQ:CENT 5 GHZ` sets the center frequency to 5 GHz

`FREQ:CENT UP` changes the center frequency to 5.1 GHz if you use `FREQ:CENT:STEP 100 MHz` to set the center frequency step size to 100 MHz

`FREQ:CENT?`

Start Freq

Sets the frequency at the left side of the graticule and sets the frequency entry mode to Start/Stop. When the Start/Stop Frequency entry mode is activated, the start and stop frequency values are displayed below the graticule in place of center frequency and span. The left and right sides of the graticule correspond to the start and stop frequencies.

When Start Freq reaches the upper frequency limit, the stop frequency is set to the highest available frequency and the start frequency is changed to be less then the stop frequency by the minimum span (10 Hz). Center Freq will be updated to the stop frequency minus one-half of the span, or to the stop frequency minus 5 Hz, and Res BW and VBW will be set to 1 Hz.

Key Path: FREQUENCY

State Saved: Saved in Instrument State

Factory Preset: 10 MHz

Range: –100 MHz to 26.99999999 GHz

Remote Command:

```
[:SENSe]:FREQuency:STARt <freq>
```

```
[:SENSe]:FREQuency:STARt?
```

Example:

```
FREQ:STAR 200 MHz
```

```
FREQ:STAR?
```

Stop Freq

Sets the frequency at the right side of the graticule and sets the frequency entry mode to Start/Stop. When the Start/Stop Frequency entry mode is activated, the start and stop frequency values are displayed below the graticule in place of center frequency and span. The left and right sides of the graticule correspond to the start and stop frequencies.

Key Path: FREQUENCY

State Saved: Saved in Instrument State

Factory Preset: 26.5 GHz

Range: –100 MHz to 27 GHz

Remote Command:

```
[:SENSe]:FREQuency:STOP <frequency>
[:SENSe]:FREQuency:STOP?
```

Example:

```
FREQ:STOP 1600
FREQ:STOP?
```

CF Step

Changes the step size for the center frequency and start/stop frequency functions. Once a step size has been selected and the center frequency function is activated, the step keys (and the UP|DOWN parameters for Center Frequency from remote commands) change center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the N8201A. When auto-coupled in a non-zero span, the center frequency step size is set to 10% of the span.

Key Path: FREQUENCY

State Saved: Saved in Instrument State

Factory Preset: Span/10

Range: 1 Hz to 27 GHz

Remote Command:

```
[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>
[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?
```

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Example:

FREQ:CENT:STEP:AUTO ON

FREQ:CENT:STEP 500 MHz

FREQ:CENT UP increases the current center frequency value by 500 MHz

FREQ:CENT:STEP?

FREQ:CENT:STEP:AUTO?

Freq Offset

Enables you to input a frequency offset value to account for frequency conversions external to the N8201A. This value is added to the display readout of the marker frequency, center frequency, start frequency, stop frequency and all other absolute frequency settings in the N8201A. When a frequency offset is entered, the value appears below the center of the graticule. Offsets may be entered using the keyboard. To eliminate an offset, perform a Factory Preset or set the frequency offset to 0 Hz.

This command does not affect any bandwidths or the settings of relative frequency parameters such as delta markers or span. It does not affect the current hardware settings of the N8201A, but only the displayed frequency values. Offsets are not added to the frequency count readouts. Entering an offset does not affect the trace display.

Key Path: FREQUENCY

State Saved: Saved in Instrument State

Factory Preset: 0 Hz

Range: –500 THz to 500 THz

Remote Command:

```
[:SENSe]:FREQuency:OFFSet <freq>
```

```
[:SENSe]:FREQuency:OFFSet?
```

Example:

```
FREQ:OFFS 10 MHz
```

Signal Track

When a marker is placed on a signal and Signal Track is pressed, the marker will remain on the signal while the N8201A retunes the center frequency to the marker frequency. The N8201A will keep the signal at the center of the display, as long as the amplitude of the signal does not change by more than 3 dB from one sweep to another. If no marker is active, pressing Signal Track to On will activate a marker, perform a peak search, and center the marker on the display.

If the signal is lost, an attempt will be made to find it again and continue tracking. If there are other signals on screen near the same amplitude, one of them may be found instead. Signals near 0 Hz cannot be tracked effectively as they cannot be distinguished from the LO feedthrough, which is excluded by intent from the search algorithm.

When Signal Track is On and the span is reduced, an automatic zoom is performed and the span is reduced in steps so that the signal remains at the center of the display. If the span is zero, signal track cannot be activated.

This function is intended to track signals with a frequency that is changing (drifting), and an amplitude that is not changing. It keeps tracking if in continuous-sweep mode. If in single-sweep mode, the N8201A only does one center frequency adjustment as necessary.

Signal tracking can also be used with the Δ (delta) pair marker function. This could be used to measure the amplitude at a frequency offset, relative to the fundamental signal amplitude, even if the fundamental is drifting. In this situation, the “tracking” function will be done on the delta marker, not on the reference marker. So you would want to put the ref marker on the frequency+offset, and put the Δ marker on the fundamental signal peak. Then turn on signal tracking. The frequency difference between the two markers will stay fixed. The Δ marker, on the fundamental, will track to the center of the display. The marker readout value will show the amplitude delta between the two markers.

Key Path: FREQUENCY

Annunciation/Annotation: ST appears near the lower-left corner of the display. An asterisk (*) may appear in the upper-right corner of the display while the N8201A whenever the N8201A finds that it must retune in order to center the signal on the display.

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:TRCKing[:STATe] OFF|ON|0|1
:CALCulate:MARKer[1]|2|3|4:TRCKing[:STATe]?
```

Example:

`CALC:MARK1:TRCK ON` turns on Signal Track using Marker 1.

`CALC:MARK1:TRCK?.`

9 Input/Output

Displays the keys that control some of the N8201A's signal inputs and outputs.

Input Port

Brings up a menu of input signal sources, the most common one being the front panel RF Input port.

Key Path: Input/Output

State Saved: Saved in Instrument State

Factory Preset: RF

Remote Command:

```
[:SENSe]:FEED RF|AREFerence|EMIXer
[:SENSe]:FEED?
```

Example:

`FEED AREF` selects the 50 MHz amplitude reference as the signal input.

RF

Selects the front panel RF Input port to be the N8201A signal input.

Key Path: Input/Output, Input Port

Remote Command:

See "Input/Output" on page 183.

Example:

`FEED AREF` selects the 50 MHz amplitude reference as the signal input.

Amptd Ref

Selects the 50 MHz, –25 dBm internal amplitude reference as the input signal.

Key Path: Input/Output, Input Port

Remote Command:

See "Input/Output" on page 183.

Example:

`FEED AREF` selects the 50 MHz amplitude reference as the signal input.

RF Coupling

Specifies alternating current (AC) or direct current (DC) coupling at the N8201A RF input port. Selecting AC coupling switches in a blocking capacitor that blocks any DC voltage present at the N8201A input. This decreases the input frequency range of the N8201A, but prevents damage to the input circuitry of the N8201A if there is a DC voltage present at the RF input.

In AC coupling mode, signals less than 20 MHz are not calibrated. You must switch to DC coupling to see calibrated frequencies of less than 20 MHz.

Some amplitude specifications apply only when coupling is set to DC. Refer to the appropriate amplitude specifications and characteristics for your N8201A.

When operating in DC coupled mode, ensure protection of the input mixer by limiting the input level to within 200 mV of 0 Vdc. In AC or DC coupling, limit the input RF power to +30 dBm.

Key Path: Input/Output

Dependencies/Couplings: In external mixing mode, input port and RF coupling selection are not available.

State Saved: Saved in Instrument State

Factory Preset: AC

Remote Command:

```
:INPut:COUPling AC|DC
```

```
:INPut:COUPling?
```

Example:

```
INP:COUP DC
```

Input Mixer (Option AYZ only)

Selects either the internal mixer(s) or an external mm-wave mixer. When internal mixing is selected you get normal N8201A operation and the rest of the external mixing functions are unavailable. With external input mixer selected you can analyze high frequency signals (higher than the N8201A maximum frequency) by using an appropriate external mixer.

Key Path: Input/Output

Annunciation/Annotation: "Ext Mix" on top line, replacing the attenuator value

Dependencies/Couplings: Not available when Preamplifier is set to On.

Remote Command:

See"Input/Output" on page 183.

```
:INPut:MIXer INT|EXT
```

Example:

FEED EMIX selects the external mixer as the signal input.

```
:INP:MIX EXT
```

```
:INP:MIX?
```

Ext Mix Band (Option AYZ only)

Displays the key menus to select one of the predefined bands corresponding to the external mixer being used. You can define your own frequency band by selecting User. Setting the Harmonic key to manual also selects the User band.

Key Path: Input/Output, Input Mixer

Dependencies/Couplings: When Mixer Config, Mixer Type is set to Presel (preselected), the following bands are not available: K, E, W, F, D, G, Y, J.

State Saved: Saved in Instrument State

Factory Preset: A Band, 26.5 to 40 GHz

Remote Command:

```
[:SENSe]:MIXer:BAND K|A|Q|U|V|E|W|F|D|G|Y|J|USER
```

```
[:SENSe]:MIXer:BAND?
```

Example:

```
MIX:BAND W
```

If Harmonic is set to Man, a query will return “USER”. K, E, W, F, D, G, Y, and J are not available if the mixer type is set to Presel.

18-26.5 GHz (K)

Selects K band (mixing harmonic –6). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –6 harmonic band.

Key Path: `Input/Output, Input Mixer, Ext Mix Band`

Remote Command:

Example: `MIX:BAND K`

26.5-40 GHz (A)

Selects A band (mixing harmonic –8). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –8 harmonic band.

Bands A, Q, U, and V are available with both preselected and unpreselected mixers. The sign of the harmonic value changes with the mixer type. For example with A Band preselected mixer, the harmonic value is 8 while the unpreselected value is -8.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: `MIX:BAND A`

33-50 GHz (Q)

Selects Q band (mixing harmonic –10). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –10 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND Q

40-60 GHz (U)

Selects U band (mixing harmonic –10). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –10 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND U

50-75 GHz (V)

Selects V band (mixing harmonic –14). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –14 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND V

60-90 GHz (E)

Selects E band (mixing harmonic –16). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –16 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND E

75-110 GHz (W)

Selects W band (mixing harmonic –18). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –18 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND W

90-140 GHz (F)

Selects F band (mixing harmonic –20). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –20 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND F

110-170 GHz (D)

Selects D band (mixing harmonic –24). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –24 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND D

140-220 GHz (G)

Selects G band (mixing harmonic –32). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –32 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND G

170-260 GHz (Y)

Selects Y band (mixing harmonic –38). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –38 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND Y

220-325 GHz (J)

Selects J band (mixing harmonic –46). Displays the start and stop frequencies for that particular band. Other start/stop frequencies are available as long as they are within the –46 harmonic band.

Key Path: Input/Output, Input Mixer, Ext Mix Band

Remote Command:

Example: MIX:BAND J

User

Lets you define the frequency band for your Input Mixer. The frequencies available depend on the currently selected harmonic mixing number. Use Mixer Config, Harmonic to select a particular harmonic number.

Preselected External Mixer Frequency Ranges vs. Harmonic Number

For N = positive harmonic mixing band numbers:

Minimum frequency = $(N \times 2.9 GHz) + 321.4 MHz$

Maximum frequency = $(N \times 6.666 GHz) + 321.4 MHz – 650 MHz$

For N = negative harmonic mixing band numbers:

Minimum frequency = $(N \times 2.9 GHz) – 321.4 MHz + 650 MHz$

Maximum frequency = $(N \times 6.666 GHz) – 321.4 MHz$

Unpreselected External Mixer Frequency Ranges vs. Harmonic Number

For N = positive harmonic mixing band numbers:

Minimum frequency = $(N \times 2.9 GHz) + 321.4 MHz$

Maximum frequency = $(N \times 6.9 GHz) + 321.4 MHz – 650 MHz$

For N = negative harmonic mixing band numbers:

Minimum frequency = $(N \times 2.9 GHz) – 321.4 MHz + 650 MHz$

Maximum frequency = $(N \times 6.9 GHz) – 321.4 MHz$

The 650 MHz term in the equations above is approximately 2x IF. This term is for the signal identification algorithm. The 6.666 GHz term is the maximum LO range based on the preselector tune circuitry in the N8201A.

Saved State Saved in Instrument State

Key Path: Input/Output, External Mixer, Ext Mix Band

Remote Command:

See"Ext Mix Band (Option AYZ only)" on page 186.

Example:

```
MIX:BAND USER
MIX:HARM -14
```

Signal ID (Option AYZ only)

Activates a signal identification algorithm when Signal ID is on, which either removes or aids with the identification of multiple and image responses of true input signals. Multiple and image responses may be generated when using unpreselected external mixers.

The amplitude accuracy of the N8201A is degraded when signal identification is on. Use Signal ID to identify true signals, then turn Signal ID off to make accurate amplitude measurements.

If the input signal is too broadband or unstable for the identification process to properly identify it, turn off the signal identification and look for two similar responses separated by approximately 642.8 MHz (twice the 321.4 MHz first IF). If a "–" mixer mode (for example: 8–) is active, the right member of the response pair is the correct response; if a "+" mixer mode is active, the left member of the response pair is the correct response.

Key Path: Input/Output, External Mixer

Annunciation/Annotation: "SID" message appears on the upper right of the screen when the signal ID is turned on.

Dependencies/Couplings:

Not available when:

- Averaging is set to on
- Manual FFT mode
- Sig Track is set to on
- Preselected external mixer selected

State Saved: Saved in Instrument State

Factory Preset: Off

Remote Command:

```
[:SENSe]:SIDentify[:STATe] OFF|ON|0|1
[:SENSe]:SIDentify:[STATe]?
```

Example:

```
SID 1
```

Signal ID Mode

Displays a menu to select the method of signal identification.

Key Path: Input/Output, External Mixer

State Saved: Saved in Instrument State

Factory Preset: Image Suppress

Remote Command:

```
[:SENSe]:SIDentify:MODE ISUPpress|ISHift
[:SENSe]:SIDentify:MODE?
```

Example:

```
SID:MODE ISH
```

Image Suppress

This signal identification method attempts to suppress all but valid responses by mathematically removing all image and multiple responses of signals present at the mixer input. The N8201A internally acquires the data in a two sweep sequence, operates on the acquired data, and displays the result in Trace 1. Since two measurements are taken for each display cycle, the display update rate is reduced.

Key Path: Input/Output, External Mixer, Signal ID Mode

State Saved: Saved in Instrument State

Remote Command: See "Signal ID Mode" on page 192.

Example:

```
SID:MODE ISUP
```

Image Shift

Performs signal identification in a two sweep sequence. Places data from the first sweep in Trace 1, and data from the second (frequency shifted) sweep in Trace 2. Signal responses of Trace 1 and Trace 2 having the same horizontal position are considered to be in the current band and therefore can be analyzed with the amplitude and frequency measurement systems of the N8201A. All other responses are invalid and should be ignored.

Key Path: Input/Output, External Mixer, Signal ID Mode

State Saved: Saved in Instrument State

Remote Command: See "Signal ID Mode" on page 192.

Example: `SID:MODE ISH`

Mixer Config

Displays the Mixer Config menu keys to manually set the harmonic, select the preselected mixers or unpreselected mixers, and adjust the internal bias source for use with mixers requiring bias.

Key Path: Input/Output, External Mixer

State Saved: Saved in Instrument State

Harmonic

The harmonic mixing number, its associated sign, and the availability of mixer bias can be automatically controlled by setting Harmonic to Auto. In Auto, the harmonic number and sign are determined by the Ext Mix Band selected. For bands A, Q, U and V, they are determined by the Ext Mix Band and by whether Mixer Type is set to preselected or unpreselected. There are no auto rules for Ext Mix Band set to Auto, therefore, selecting Auto forces Ext Mix Band to A band.

The harmonic number indicated is a signed number. Positive numbers (sign not displayed) indicate that the tuned frequency is above the desired LO harmonic by the 321.4 MHz IF. Negative numbers indicate an LO harmonic below the tuned frequency by the 321.4 MHz IF.

Key Path: Input/Output, External Mixer, Mixer Config

State Saved: Saved in Instrument State

Factory Preset: Auto

Range: –50 to 50, cannot be set to 0.

Remote Command:

```
[:SENSe]:MIXer:HARMonic:AUTO OFF|ON|0|1 or <boolean>

[:SENSe]:MIXer:HARMonic:AUTO?

[:SENSe]:MIXer:HARMonic <integer>

[:SENSe]:MIXer:HARMonic?
```

Example:

```
MIX:HARM:AUTO 0

MIX:HARM 8
```

Mixer Type

Selects which type of mixer is in use. Mixer Type (Presel) activates a tuning signal that is routed to the PRESEL OUT connector on the front panel of the N8201A. This signal has a sensitivity of 1.5V/GHz of the LO frequency and drives the tune input of the HP/Agilent 11974 series of preselected mixers. The sweep rate in Presel mode is limited to 40 MHz/ms.

Key Path: Input/Output, External Mixer, Mixer Config

Dependencies/Couplings: Only available in bands A, Q, U and V, and only when Mixer Bias is off.

State Saved: Saved in Instrument State

Factory Preset: Unpre

Remote Command:

```
:INPut:MIXer:TYPE PRESelected|UNPReselect

:INPut:MIXer:TYPE?
```

Example: `INP:MIX:TYPE UNPR`

Mixer Bias

Turns on/off the Mixer Bias and adjusts an internal bias source for use with external mixers.

Key Path: Input/Output, External Mixer, Mixer Config

Dependencies/Couplings: If Mixer Type is set to Presel *and* Harmonic is set to Auto, then the Mixer Bias key is set to Off and it is not available (grayed out).

If Mixer Bias is set to On *and* Harmonic is set to Auto, then the Mixer Type key is set to Unpresel and it is not available (grayed out).

State Saved: Saved in Instrument State

Range: –10 to 10 mA

Remote Command:

```
[:SENSE]:MIXer:BIAS <number>
[:SENSE]:MIXer:BIAS?
[:SENSE]:MIXer:BIAS:STATe OFF|ON|0|1
[:SENSE]:MIXer:BIAS:STATe?
```

Example:

```
MIX:BIAS 1
MIX:BIAS?
MIX:BIAS:STAT 1
MIX:BIAS:STAT?
```

321.4 MHz IF Out Opt

Configures the IF path for the default narrow band measurement path (Spectrum Analysis) or for improved 321.4 MHz IF out performance. Diverting the IF using the down converter setting lets you take advantage of this improved frequency response at the output port, but you can no longer use the internal path for making measurements.

Key Path: Input/Output

Saved State: Saved in Instrument State

Factory Preset: Spectrum Analyzer

Remote Command:

```
:OUTPut:ANALog SANalyzer|DNWB
```

```
:OUTPut:ANALog?
```

Example:

```
OUTP:ANAL DNWB
```

```
:OUTP:ANAL?
```

Spectrum Analyzer

Switches the IF path to the `N8201A` path that is used for normal operation.

Key Path: `Input/Output, 321.4 MHz IF Out Opt`

Remote Command:

See "Ext Mix Band (Option AYZ only)" on page 186.

Microwave Preselector (Option 123 Only)

Switches the input signal path between the normal preselected mixer and an optional unpreselected high band mixer. The preselected path is the normal path for the N8201A.

The first mixer can be overloaded if a large out-of-span signal is present at the input. When the preselector is bypassed, this signal passes through to the mixer causing an overload. The instrument cannot detect this condition, so no overload error message is displayed.

Key Path: Input/Output

Dependencies/Couplings: The functionality is *not* available:

- if the start frequency is in band zero (<2.85 GHz).
- when using a Mode other then Spectrum Analysis, such as Phase Noise and Noise Figure.

If the preselector state is off, then the instrument start frequency is limited to frequencies ≥3.05 GHz.

Saved State: Saved in Instrument State

Factory Preset: On

Key Path: Input/Output

Remote Command:

```
[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe] ON|OFF|0|1
```

```
[:SENSe]:POWer[:RF]:MW:PRESelector[:STATe]?
```

Example:

```
POW:MW:PRES OFF
```

10 Marker ->

Accesses menu keys that can copy the current marker value into other instrument parameters (for example, Center Frequency).

Sets the center frequency of the N8201A to the frequency of the selected marker. The marker stays at this frequency, so it moves to the center of the display. This function is not available in Zero Span.

Key Path: Marker ->

Remote Command:

`:CALCulate:MARKer[1]|2|3|4[:SET]:CENTer`

Example:

`CALC:MARK2:CENT` sets the CF of the N8201A to the value of marker 2.

Mkr->CF Step

Sets the center frequency (CF) step size of the N8201A to the marker frequency, or in a delta-marker mode, to the frequency difference between the delta and reference markers. The step size is displayed in the third line of the active function area of the display. This function is not available in Zero Span.

Key Path: Marker ->

Remote Command:

`:CALCulate:MARKer[1]|2|3|4[:SET]:STEP`

Example:

`CALC:MARK1:STEP` sets the CF step to the value (or delta value) of marker 1.

Mkr->Start

Changes the start frequency to the frequency of the active marker. The marker stays at this frequency, so it moves to the left of the display. This function is not available in Zero Span.

Key Path: Marker ->

Remote Command:

`:CALCulate:MARKer[1]|2|3|4[:SET]:STARt`

Example:

`CALC:MARK1:STAR` sets the start frequency to the value (or delta value) of marker 1.

Mkr->Stop

Changes the stop frequency to the frequency of the active marker. The marker stays at this frequency, so it moves to the right of the display. This function is not available in Zero Span.

Key Path: Marker ->

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4[:SET]:STOP
```

Example:

`CALC:MARK1:STOP` sets the stop frequency to the value (or delta value) of marker 1.

MkrΔ->Span

Sets the start and stop frequencies to the values of the delta markers. The marker is then set to normal at the center frequency. Only available in Delta, Span Pair, and Delta Pair modes. This function is not available if the marker is off, or in Normal mode or when the span is Zero Span.

Key Path: Marker ->

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4[:SET]:DELTa:SPAN
```

Remote Command Notes:

Select the delta marker mode with `:CALCulate:MARKer[1]|2|3|4:MODE DELTa`.

Example:

`CALC:MARK2:DELT:SPAN` sets the start and stop frequencies to the values of the delta markers of marker 2.

MkrΔ->CF

Sets the delta marker to the center frequency. Only available in Delta, Span Pair, and Delta Pair modes. This function is not available if the marker is off, or in Normal mode or when the span is Zero Span.

Key Path: Marker ->

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4[:SET]:DELTa:CENTer
```

Remote Command Notes:

Select the delta marker mode with `:CALCulate:MARKer[1]|2|3|4:MODE DELTa`.

Example:

`CALC:MARK2:DELT:CENT` sets the center frequency to the value of the delta marker center frequency of marker 2.

Mkr->Ref Lvl

Sets the reference level to the amplitude value of the active marker, moving the marked point to the reference level (top line of the graticule).

Key Path: Marker ->

The reference level range is limited by the input attenuator setting, the maximum mixer level, the preamp setting, etc.

Remote Command:

`:CALCulate:MARKer[1]|2|3|4[:SET]:RLEVel`

Example:

`CALC:MARK2:RLEV` sets the reference level of the N8201A to the amplitude of marker 2.

11 Marker

Allows you to access the marker control menu.

Normal (`POSition`) - A single marker that can be moved to any point on the trace.

Delta (`DELTa`) - A fixed reference marker and a moveable marker that you can place at any point on the trace.

Delta Pair (`BAND`) - Both a movable delta and a movable reference marker. You can independently adjust the position of each marker.

Span Pair (`SPAN`) - A moveable reference and a movable delta marker. You can adjust the center point of the markers and the frequency span between the markers.

Off (`Off`) - Turns off the active marker or marker pair.

Your instrument stores data to a high degree of resolution and accuracy. It is often difficult to read the trace data directly from the screen to the desired accuracy. Markers are diamond-shaped pointers that can be placed at any point on a trace to accurately read the data at that point. Markers may also be use in pairs to read the difference (or *delta*) between two data points. The marker number is indicated at the top right-side of the display and also in the lower portion of the left pane, under the Marker tab. Use the Position controls to position the marker. If a value is entered from the keyboard, the marker is moved to the trace point nearest to that value.

There are four markers in your instrument; each can be controlled as a single marker or as a reference/delta pair.

A *trace* is a connected series of points displayed on the display. The left-most point is point 0 and the right-most point (default) is 600. You control markers by moving them from trace point or by trace units. (By selecting from the Specifier box in the lower-right pane under the Marker tab.) *Markers* are shaped like diamonds. The lowest point of the diamond shape represents the trace point that is being read. The marker number is indicated above the active marker. The same marker number is indicated with an R (for example, `1R`) above the reference marker when in a delta mode (delta, delta pair, and span pair).

Marker Units

- Normal markers - the display shows the value of the Y-axis position of the marker in the current Y-axis units. (See Amplitude,"Y Axis Units" on page 56.)

- Delta, Delta Pair, or Span Pair markers - the display shows the ratio (difference when expressed in dB) between two markers. If the Y-axis units are logarithmic (dBm, dBmV, dBµV) the ratio is express in dB. If the Y-axis units are linear (volts, watts) the ratio is expressed in percent (where 100% is the same as 0 dB difference). Note that the value when the Y-axis units are watts is the square of the value when the Y-axis units are volts. For example, when the percent ratio with Y-axis units in volts is 20% (0.2), the percent ratio with Y-axis units in watts will be 4% ($0.2^2 = 0.04$). When you read the value out remotely, you have to know whether you are in log (dB) or linear (percent).
- Marker functions (Marker Noise and Band/Intvl Power) - the display shows the values with units that are dependent on the function and the Y-axis units. Refer to the individual function descriptions for more details about the units used. When you read the value out remotely, you have to know what the expected units are.

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:MODE
POSition|DELTa|BAND|SPAN|OFF
```

```
:CALCulate:MARKer[1]|2|3|4:MODE?
```

Sets or queries the marker control mode (see parameter list above).

```
:CALCulate:MARKer[1]|2|3|4:X <param>
```

Sets the marker X position to a specified point on the X axis in the current X-axis units (frequency or time). If the frequency or time chosen would place the marker off screen, the marker will be placed at the left or right side of the display, on the trace. This command has no effect if the marker is off.

```
:CALCulate:MARKer[1]|2|3|4:X?
```

Queries the marker X position in the current x-axis units. The marker must be on for the response to be valid.

```
[:SENSe]:MARKer[1]|2|3|4:X:POSition <param>
```

Sets the marker X position to a specified point on the X axis in display points (values of 0 to 600, or the current number of points in the sweep). The marker must already be on.

```
[:SENSe]:MARKer[1]|2|3|4:X:POSition?
```

Returns the current marker X position in display points.

```
:CALCulate:MARKer[1]|2|3|4:Y?
```

Queries the marker Y value or delta in the current y axis units. Can also be used to read the results of marker functions such as Marker Noise. The marker must be on for the response to be valid.

Remote Command Notes:

The `:CALC:MARK:PEAK:SEARC:MODE MAX|PAR` command specifies how a peak is identified for use with the marker commands. See "Peak Search" on page 429.

Example:

`CALC:MARK:MODE POS` selects marker 1 and sets it to Normal.

`CALC:MARK2:X 20 GHZ` selects marker 2 and moves it to 20 GHz. (Marker 2 must first be turned on.)

Select Marker

Selects one of the four possible marker or marker pairs. Once a marker is selected, it can be set to any of the control modes, Normal, Delta, Delta Pair, Span Pair, or Off.

Key Path: Marker

State Saved: The number of the selected marker is saved in Instrument State.

Factory Preset: Marker 1

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:STATe OFF|ON|0|1`

`:CALCulate:MARKer[1]|2|3|4:STATe?`

Sets or queries the state of a marker. Setting a marker to state ON or 1 selects that marker. Setting a marker which is OFF to state ON or 1 puts it in Normal mode and places it at the center of the display. Setting a marker to state OFF or 0 selects that marker and turns it off. The response to the query will be 0 if OFF, 1 if ON.

Example:

`CALC:MARK2:STAT ON` selects marker 2.

`CALC:MARK:STAT ON` will not modify a marker that is already on.

Normal

Sets the control mode for the selected marker to Normal (see "Marker" on page 203). If the marker is off, a single marker is activated at the center of the display. The marker stays on the trace at the horizontal screen position where it was placed unless Signal Track, or a "marker to" key function (such as Mkr → CF, Mkr → RL, Mkr → CF STEP, Mkr Δ Span, or Min Search) is selected. If you are in a marker pair mode, for example Delta Marker, the reference marker is turned off. You can then adjust the trace point of the marker.

Key Path: Marker

Remote Command:

See "Marker" on page 203 for the mode command.

Example:

`:CALC:MARK:MODE POS` selects marker 1 and sets it to Normal.

Delta

Sets the control mode for the selected marker to Delta (see "Marker" on page 203). In Delta mode the display shows the difference between the active (Delta) marker and a reference marker. When Delta mode is selected the reference marker is placed at the current marker position. If the marker is OFF both the active marker and the reference marker are placed at the center of the display. The amplitude and frequency (or time) of the first marker is fixed. The marker number is indicated above the delta marker, and the same number is indicated with an `R` (for example, `1R`) above the reference marker. You can adjust the trace point of the active delta marker. Annotation in the active function block and in the upper-right corner of the display indicates the frequency or time difference and amplitude difference of the two markers. If marker noise is set to On while using Delta and the noise marker is placed on the noise floor, the marker readout displays signal-to-noise.

Selecting Delta while already in Delta mode causes the reference marker to be reset to the current active (Δ) marker position, enabling you to make delta measurements from differing reference points without having to turn off the markers and begin again. Pressing Marker Normal moves the Reference Marker to the Delta Marker position and turns off Delta Marker.

The amplitude of the reference marker is fixed. In non-zero spans the frequency of the reference marker is fixed. If the center frequency of the N8201A is changed such that the reference marker is off the screen, an arrow will appear with the marker number at the left or the right side of the display. This indicates where the trace point is for the reference marker.

In Zero Span the reference marker remains fixed at the trace point on which it was placed. Also, changing Center Frequency does not move the reference marker while in Zero Span.

The markers will be turned off if the scale type is changed between log and linear.

Key Path: Marker

Remote Command:

See "Marker" on page 203 for the mode command.

Example:

`CALC:MARK4:MODE DELT` selects marker 4 as a delta marker and places a reference marker at the marker 4 position. If marker 4 is OFF it places both the active and the reference markers at the center of the display.

Delta Pair

Sets the control mode for the selected marker to Delta Pair (see "Marker" on page 203). In Delta Pair mode the display shows the difference between the delta marker and a reference marker and enables you to adjust both the Ref (start) and Delta (stop) markers independently. In the lower-right pane you can control both markers independently using

the Ref and Position scroll bars.The start marker number is indicated with a number and an R above the marker (for example, 1R) and the delta marker is indicated with a marker number.

There are four conditions that can occur when Delta Pair mode is selected:

If marker mode is Off, the delta marker and reference marker are placed at the center of the display.

If marker mode is Normal, the delta marker and reference marker are placed at the current marker position on the trace.

If the marker mode is Delta, the current marker position remains unchanged and the reference marker is placed on the trace at the reference marker position.

If the marker mode is Span Pair, the marker positions remain unchanged.

The difference between Delta Pair and Delta modes is that in Delta Pair mode the reference marker stays on the trace and you can adjust its trace point. The note (Tracking Ref) appears on the Delta Pair key because, in effect, the reference marker "tracks" the trace. (By comparison, in Delta mode the reference marker does not track changes in the trace results; it remains anchored in amplitude and frequency.)

Once positioned, the markers stay on the trace points you have selected. Ref and Delta markers maintain their displayed x-axis location, but not their frequency values when you change a parameter that redefines the x-axis scale. Reset these markers when parameters such as Span or Center Freq are changed. Adjusting the Span changes the difference between the two markers. Changing the Center changes the center point of the two markers. Changing the frequency or sweep time of the N8201A does not change the trace point of the markers. You cannot move the markers off the screen.

Key Path: Marker

Factory Preset: Factory preset marker mode is Off.

Range: Refer to the `[:SENSe]:SWEep:POINts` command under "Points" on page 472.

Remote Command:

See "Marker" on page 203 for the command to select the control mode.

```
:CALCulate:MARKer[1]|2|3|4:X:STARt <param>
:CALCulate:MARKer[1]|2|3|4:X:STOP <param>
:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt <integer>
:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP <integer>
```

The above commands set the reference (Start), or delta (Stop) marker X locations on the X axis. The markers can be placed on the X axis using the current trace units. Or you can specify their position in display points. Display points are values from 0 to 600 (or the current number of points in the sweep). The marker must already be on.

```
:CALCulate:MARKer[1]|2|3|4:X:STARt?
```

```
:CALCulate:MARKer[1]|2|3|4:X:STOP?
```

```
:CALCulate:MARKer[1]|2|3|4:X:POSition:STARt?
```

```
:CALCulate:MARKer[1]|2|3|4:X:POSition:STOP?
```

These commands return the reference (Start), or delta (Stop) marker X value in current X axis units, or the by its position in display points.

Example:

`CALC:MARK3:MODE BAND` activates or selects marker 3 and sets it to Delta Pair. Refer to "Marker" on page 203.

`CALC:MARK3:X:POS:STAR 0` moves the reference marker 3 to the left edge of the display.

Span Pair

Sets the control mode for the selected marker to Span Pair (see "Marker" on page 203). In Span Pair mode the display shows the difference between the delta marker and a reference marker and enables you to adjust both the ref and delta markers. The start marker number is indicated with a number and an `R` above the marker (for example, `1R`) and the stop marker is indicated with a marker number. You can control the two markers (under the Markers tab) in the lower portion of the right pane using the Center and Span scroll bars.

Adjusting the Span changes the frequency difference between the two markers. Adjusting Center maintains the marker spacing and changes the frequency of the midpoint between the markers. Adjusting the span changes the frequency difference between the two markers while maintaining the midpoint between the two markers at a fixed frequency. Changing the center changes the center point between the two markers while maintaining the frequency difference.

There are four conditions that can occur when Span Pair mode is selected:

If marker mode is Off, the delta marker and reference marker are placed at the center of the display.

If marker mode is Normal, the delta marker and reference marker are placed at the current marker position on the trace.

If the marker mode is Delta, the current marker position remains unchanged and the reference marker is placed on the trace at the reference marker position.

If the marker mode is Delta Pair, the marker positions remain unchanged.

The difference between Span Pair and Delta modes is that in Span Pair mode the reference marker stays on the trace and you can adjust its trace point.

Once positioned, the markers stay on the trace points on which they have been placed. Changing the frequency or time of the N8201A does not change the trace point of the markers, that is, they stay at the same horizontal position on the display.

You cannot move the markers off the screen. If you adjust either center or span to a value that would cause one of the markers to move off screen, the marker will be placed at the right or left side of the display, on the trace. Changing the Center marker changes the center point of the two markers. This function is useful in functions such as **Marker Fctn** > **Band Power**.

Key Path: Marker

Range: Refer to the `[:SENSe]:SWEep:POINts` command under "Points" on page 472.

Remote Command:

See "Marker" on page 203 for the command to select the control mode.

```
:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer <param>
```

Sets the mid point of the markers to a specific trace point.

```
:CALCulate:MARKer[1]|2|3|4:X:POSition:CENTer?
```

Returns the midpoint trace point.

```
:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN <param>
```

Sets the spacing between the markers to a specified number of trace points.

```
:CALCulate:MARKer[1]|2|3|4:X:POSition:SPAN?
```

Returns the spacing of the markers in trace points.

```
:CALCulate:MARKer[1]|2|3|4:X:CENTer <param>
```

Sets the mid point of the markers to a specific frequency with a range that matches the units of the trace on which the markers are positioned.

```
:CALCulate:MARKer[1]|2|3|4:X:CENTer?
```

Returns the midpoint frequency.

```
:CALCulate:MARKer[1]|2|3|4:X:SPAN <param>
```

Sets the spacing between the markers to a specified frequency with a range that matches the units of the trace on which the markers are positioned.

```
:CALCulate:MARKer[1]|2|3|4:X:SPAN?
```

Returns the spacing of the markers in frequency.

Example:

`CALC:MARK3:MODE SPAN` selects marker 3 and sets it to Span Pair.

`CALC:MARK4:X:POS:SPAN 200` sets the spacing between the markers to 200 trace points for marker pair 4.

`CALC:MARK2:X:POS:CENT 300` sets the midpoint between the markers to the 300th trace point from the left of the display. For a 601 point trace this will be the middle of the display.

Off

Turns off the selected marker. In addition, Off turns off functions related to the selected marker such as Signal Track, Band/Intvl Power, and Marker Noise and removes marker annotation from the display.

Key Path: Marker

Remote Command:

See "Marker" on page 203 for the command to select the control mode.

Example:

`CALC:MARK3:STAT OFF` selects marker 3 and sets it to Off.

Marker Trace

Selects the trace for the marker or marker pair. You can pick Marker Trace 1, 2, or 3.

Key Path: Marker

State Saved: The Marker Trace for each marker is saved in instrument state.

Factory Preset: Auto on, Trace 1

Range: 1 to 3

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:TRACe 1|2|3`

Puts the marker on the specified trace and turns Auto OFF for that marker.

`:CALCulate:MARKer[1]|2|3|4:TRACe?`

The query returns the number of the trace on which the marker currently resides, even if that marker is in Auto mode.

`:CALCulate:MARKer[1]|2|3|4:TRACe:AUTO OFF|ON|0|1`

Turning Auto off sets the Marker Trace value to the number of the trace on which the marker currently resides.

`:CALCulate:MARKer[1]|2|3|4:TRACe:AUTO?`

The response to the query will be 0 if OFF, 1 if ON.

Example:

`CALC:MARK1:TRAC 2` places marker 1 on trace 2.

Readout

Access a menu that enables you to affect how the x-axis information for the selected marker is displayed in the marker area (top-right of display) and the active function area of the display. It only affects the readout on the display of the horizontal position information (for example, frequency).

It does not affect the way this information is sent remotely in response to the `CALC:MARK:X?` command.

Key Path: Marker

State Saved: In Instrument State, for each marker.

Factory Preset: Frequency for non-zero spans and time for zero spans.

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:X:READout
FREQuency|TIME|ITIMe|PERiod
```

```
:CALCulate:MARKer[1]|2|3|4:X:READout?
```

Example:

`CALC:MARK3:X:READ TIME` sets the marker 3 Readout to Time.

Frequency

Sets the marker readout to Frequency, displaying the absolute frequency of a normal marker or the frequency of the delta marker relative to the reference marker. Frequency readout is the default setting in non-zero spans and is not available in zero spans.

Key Path: Marker, Readout

Remote Command:

See"Readout" on page 213 for this command.

Example:

`CALC:MARK2:X:READ FREQ` sets the marker 2 Readout to Frequency.

Period

Sets the marker readout to Period, displaying the reciprocal of the frequency at the marker position, or the reciprocal of the frequency separation of the two markers in a delta-marker mode. Period readout is not available in zero spans. If the markers are at the same frequency in a delta marker mode, the result will be the reciprocal of 0, which is infinitely large. The display will show a very large number.

Key Path: Marker, Readout

Remote Command:

See"Readout" on page 213 for this command.

Example:

```
CALC:MARK2:X:READ PER
```

Time

Sets the marker readout to Time, displaying the time interval between a normal marker and the start of a sweep or the time of the delta marker relative to the reference marker. Time is the default setting in zero spans. With a span of zero, the time value is the time position relative to the start of the sweep. In a delta-marker mode it is the (sweep) time interval between the two markers.

Key Path: Marker, Readout

Remote Command:

See"Readout" on page 213 for this command.

Example:

```
CALC:MARK2:X:READ TIME
```

Inverse Time

Sets the marker readout to Inverse Time, displaying the reciprocal of (sweep) time between two markers. This function is only available when in both zero span and in a delta-marker modes. If the markers are at the same x position, the time between them is 0, so the reciprocal of sweep time is infinitely large. The display will show a very large number.

Key Path: Marker, Readout

Remote Command:

See "Readout" on page 213 for this command.

Example:

```
:CALC:MARK2:X:READ ITIM
```

Marker Table

When set to On, the display is split into a measurement window and a marker data display window. For each marker pair, information is displayed in the data display window, which includes the marker number, trace number, marker type, X axis value, and the amplitude of the marker or the delta value, if a delta marker, or the function value, if in a marker function such as Marker Noise or Band/Intvl Power.

Selecting any measurement (including Meas Off) under Measure turns off the marker table.

Key Path: Marker

Factory Preset: Off

Remote Command:

`:CALCulate:MARKer:TABLe:STATe OFF|ON|0|1`

`:CALCulate:MARKer:TABLe:STATe? returns 1 if ON or 0 if OFF.`

Example:

`CALC:MARK:TABL:STAT ON` turns on the marker table.

Marker All Off

Turns off all markers, including markers used for signal track. This key also turns off marker related functions such as Signal Track, Band Interval Power, and Marker Noise.

Key Path: Marker

Remote Command:

`:CALCulate:MARKer:AOFF`

Example:

`CALC:MARK:AOFF` turns off all markers.

12 Marker Fctn

Access special marker functions such as frequency counting and noise markers.

Factory Preset: Off

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:FUNCtion BPOWer|NOISe|OFF
:CALCulate:MARKer[1]|2|3|4:FUNCtion?
```

Example: `CALC:MARK:FUNC NOIS`

Select Marker

Selects one of the four possible marker or marker pairs. Once a marker is selected, it can be set to any of the control modes, Normal, Delta, Delta Pair, Span Pair, or Off.

Key Path: Marker

State Saved: The number of the selected marker is saved in Instrument State.

Factory Preset: Marker 1

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:STATe OFF|ON|0|1`

`:CALCulate:MARKer[1]|2|3|4:STATe?`

Sets or queries the state of a marker. Setting a marker to state ON or 1 selects that marker. Setting a marker which is OFF to state ON or 1 puts it in Normal mode and places it at the center of the display. Setting a marker to state OFF or 0 selects that marker and turns it off. The response to the query will be 0 if OFF, 1 if ON.

Example:

`CALC:MARK2:STAT ON` selects marker 2.

`CALC:MARK:STAT ON` will not modify a marker that is already on.

Marker Noise

Activates a noise marker for the selected marker. If the selected marker is off it is turned on and located at the center of the display. Reads out the average noise level, normalized to a 1 Hz noise power bandwidth, around the active marker. The noise marker averages 5% of the trace data values, centered on the location of the marker.

The data displayed (if the marker is in Normal mode) is the noise density around the marker. The value readout is followed by "(1 Hz)" to remind you that display is normalized to a one Hz bandwidth.

To measure carrier to noise ratio, be sure that the Marker Fctn is not Marker Noise. Select a Marker, Normal type marker. Place the marker on the signal peak, then select Delta marker. Now place the active (D) marker on the noise, and select Marker Noise to change the marker type. In this case, the reference marker has units of amplitude and the data displayed is the ratio of the noise density at the delta marker to the reference marker power. The value readout is dB/Hz if the Y-axis units are logarithmic, and % if the Y-axis units are linear. It is understood, in this case, that % stands for the units $\%/\sqrt{\text{Hz}}$ for volts units and %/Hz for watts units.

To measure the ratio of the noise densities at two locations, be sure that the Marker Fctn is Marker Noise. (The noise is averaged over a region that is 5% of the span, centered at the marker location.) Select Marker, Normal before selecting Delta marker. Then move the active (D) marker to the second noise location. In this case both markers have units of noise density (for example, dBm/Hz), so the data displayed represents the ratio of the noise density at the delta marker to the noise density at the reference marker. The value readout is displayed as a ratio (dB or %).

To guarantee accurate data for noise-like signals, a correction for equivalent noise bandwidth is made by the N8201A. The Marker Noise function accuracy is best when the detector is set to Average or Sample, because neither of these detectors will peak-bias the noise. The trade off between sweep time and variance of the result is best when Avg/VBW Type is set to Power Averaging. Auto coupling, therefore, normally chooses the Average detector and Power Averaging. Though the Marker Noise function works with all settings of detector and Avg/VBW Type, using the positive or negative peak detectors gives less accurate measurement results.

Key Path: Marker Fctn

Dependencies/Couplings: Video triggering is not available when the detector is Average, therefore marker functions that would set the detector to Average, and thus conflict with video triggering, are not available when the Video trigger is On.

Positive or negative peak detection is not recommended for use when measuring noise-like signals. Though the Marker Noise function allows you to select these detector types, the average noise measurement results will not be as accurate using peak detection as when using sample or average detection.

Remote Command:

See "Marker Fctn" on page 219 for the command to select a function.

Remote Command Notes:

Note that the value when the Y-axis units are watts is the square of the value when the Y-axis units are volts. For example, when the percent ratio with Y-axis units in volts is 20% (0.2), the percent ratio with Y-axis units in watts will be 4% ($0.2^2 = 0.04$). When you read the value out remotely you have to know whether you are in log (dB) or linear (percent), and if linear, whether volts or watts.

Example:

`CALC:MARK:FUNC NOIS` turns on marker 1 as a noise marker.

`CALC:MARK:FUNC?` returns the current setting of marker function for the marker specified. In this case it returns the string: `NOIS`.

`CALC:MARK:Y?` returns the y-axis value of the Marker Noise function for marker 1 (if Marker Noise is ON for marker 1).

Band/Intvl Power

Measures the power in a bandwidth (non-zero span) or time interval (zero span) specified by the user. If no marker is on, this key activates the delta pair marker mode. If the detector mode is set to Auto, the average detector is selected. If the Avg/VBW type is set to Auto, Power Averaging is selected, other choices of detector and Avg/VBW type will usually cause measurement inaccuracy. The active marker pair indicate the edges of the band. Only Delta Pair and Span Pair marker control modes can be used while in this function, selecting any other mode (for example, Normal or Delta) turns off this function.

The repeatability of your band power marker measurement can be impacted by the current number of sweep points being used. If you only have a few sweep points in the measurement band of interest, then small changes will have a direct impact on the measurement result. Increasing your number of sweep points will decrease that affect and improve the repeatability.

Key Path: Marker Fctn

Dependencies/Couplings: Video triggering is not available when the detector is Average, therefore, marker functions that would set the detector to Average, and thus conflict with video triggering, are not available when the Video trigger is On.

Selecting Band/Intvl Power when the marker control function is off, normal, or delta will set the marker control function to delta pair.

Your band power marker measurement accuracy and repeatability can be degraded if you are using a small number of sweep points. For example, if you are using 100 sweep points and making a very narrow band measurement, relative to the current span (<5% of span), the calculation uses only a couple of the sweep points. A more accurate/repeatable calculation is done if you increase the number of sweep points, or if you can reduce the span.

Remote Command:

See "Marker Fctn" on page 219 for the command to select a function.Example:

```
CALC:MARK:FUNC BPOW turns on marker one as a band power
marker.
```

`CALC:MARK:Y?` returns the value of the Band/Intvl Power function for marker 1 (if Band/Intvl Power is ON for marker 1).

Function Off

Turns off marker functions (Band/Intvl Power and Marker Noise).

Delta markers will remain on screen.

Key Path: Marker Fctn

Remote Command:

See "Marker Fctn" on page 219 for the command to select a function.Example:

`CALC:MARK2:FUNC OFF` turns the marker 2 function off.

Marker Count

Turns the marker frequency counter on and off for any active marker. If no marker is active before Marker Count is pressed, a marker is activated at the center of the display. An asterisk (*) may appear in the upper-right area of the display along with the message Cntr 1 (the number in the message depends on the active marker). If the marker count function is on and you change the active marker, the new active marker will use marker count. If the frequency counter function is on with only one active marker and that marker is turned off, then the frequency counter function is turned off. If the frequency counter function is on with multiple markers turned on and only one is turned off, the frequency counter function stays on. Marker Count frequency readings are not affected by the frequency offset function.

In **Zero Span** the counter continues to function, counting any signal near the center frequency of the N8201A.

Setting Marker Fctn to Off does not turn Marker Count off.

Key Path: Marker Fctn, Marker Count

State Saved: If Marker Count is on, that setting is saved in the instrument state.

Factory Preset: Off

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:FCOunt[:STATe] OFF|ON|0|1
:CALCulate:MARKer[1]|2|3|4:FCOunt[:STATe]?
:CALCulate:MARKer[1]|2|3|4:FCOunt:X?
```

Remote Command Notes:

Using the CALC:MARK[1]|2|3|4:FCO command.

If the specified marker number in the command is not the active marker, it becomes the active marker. If the marker number is not turned on, it is first turned on and then it becomes the active marker. Once the marker count function is turned on, it will be on for any active marker, not just the marker number specified when the command was sent.

Using the CALC:MARK[1]|2|3|4:FCO:X? query.

The query returns a 1 only if the marker count function is on and the marker number selected is the currently active marker. The query returns `9e15` if the marker count function is off, or if the specified marker is not the active marker.

Example:

`CALC:MARK2:FCO ON`

`CALC:MARK2:FCO:X?` returns the counted frequency.

Gate Time

Controls the length of time during which the frequency counter measures the signal frequency. For 2 ms and longer gate times, the counter resolution is 0.001 Hz. Longer gate times allow for greater averaging of signals whose frequency is "noisy", at the expense of throughput. If the gate time is an integer multiple of the length of a power-line cycle (20 ms for 50 Hz power, 16.67 ms for 60 Hz power), the counter rejects incidental modulation at the power line rate. The shortest gate time that rejects both 50 and 60 Hz modulation is 100 ms, which is the value chosen when gate time is in **Auto**.

Key Path: Marker Fctn, Marker Count

State Saved: Saved in Instrument State.

Factory Preset: Auto, 100 ms

Range: 1 µs to 500 ms

Remote Command:

`:CALCulate:MARKer:FCOunt:GATetime:AUTO OFF|ON|0|1`

`:CALCulate:MARKer:FCOunt:GATetime:AUTO?`

`:CALCulate:MARKer:FCOunt:GATetime <time>`

`:CALCulate:MARKer:FCOunt:GATetime?`

Example:

`CALC:MARK:FCO:GAT:AUTO On`

`CALC:MARK:FCO:GAT 1e-2` sets the gate time to 10^{-2} s = 10 ms.

13
Meas Control

These functions allow you to pause and resume the currently selected measurement and to select between continuous or single measurements. When Measure > Measure Off is selected the Meas Control functions are not available.

If no measurement has been selected from the MEASURE menu, these functions are not available.

Key Path: Front-panel key

Restart

This function restarts a previously paused measurement at the beginning. If the current measurement is still in process, it will stop it as soon as possible and restart it from the beginning.

Key Path: Front-panel key. It can also be found under Meas Control.

Remote Command:

```
:INITiate:RESTart
```

Remote Command Notes:

This command is equivalent to sending an `:ABORt` command followed by an `:INITiate[:IMMediate]` command. See"Abort the Sweep or Measurement (Remote Command Only)" on page 232. for more information.

Example:

```
INIT:REST
```

Measure

Switches the N8201A between triggering the current measurement/sweep continuously or triggering a single measurement. The front panel Single key also puts the N8201A in single-measurement mode.

Key Path: Meas Control

State Saved: Save

Factory Preset: Continuous

Remote Command:

Use `:INITiate:CONTinuous OFF|ON`. See "" on page 459.

Remote Command Notes:

This command affects sweeping when in the SA mode. It affects measurements when a measurement has been selected from the MEASure command subsystem.

- When ON, at the completion of each trigger cycle, the trigger system immediately initiates another trigger cycle.
- When OFF, the trigger system remains in an "idle" state until CONTinuous is set to ON or an :INITiate[:IMMediate] command is received. On receiving the :INITiate[:IMMediate] command, it will go through a single trigger cycle, and then return to the "idle" state.
- The query `INIT:CONT?` returns 1 or 0. 1 is returned when the instrument is continuous triggering. 0 is returned when it is single triggering.

Example:

```
INIT:CONT OFF
```

Pause or Resume

This function pauses the currently running measurement. Pressing Pause toggles between pausing and resuming your measurement. The key label toggles between Pause and Resume. If an averaged measurement was in progress, the average counter is frozen when the measurement is halted

Key Path: Meas Control

Remote Command:

```
:INITiate:PAUSe
```

```
:INITiate:RESume
```

Example:

```
INIT:PAUS
```

Remote Command Notes:

See “Abort the Sweep or Measurement (Remote Command Only)" on page 232 for more information.

Trigger a Sweep or Measurement (Remote Command Only)

This command initiates a sweep if in SA mode with no measurement currently selected.

The command is ignored if the instrument is in a measurement (selected under the MEASURE key), but the measurement is currently running, (`INITiate:CONTinuous ON`).

If a measurement is selected but it is in the idle state (that is, it is not running, `INITiate:CONT OFF`), this command triggers the instrument, when trigger conditions are met. The trigger system is initiated, then completes one full trigger cycle and returns to the "waiting" state. Depending on the measurement selected and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle. The instrument must have external triggering selected, or the command is ignored. Use the `TRIGer[:SEQuence]:SOURce EXT` command to select the external trigger.

Remote Command:

`:INITiate[:IMMediate]`

Remote Command Notes:

See also the `*TRG` command and the TRIGger subsystem.

Use the `[:SENSe]:<meas>:TRIGger:SOURce` command to select the desired trigger. The instrument must be in the single measurement mode. If `:INITiate:CONTinuous is ON` then the command is ignored.

Use `:FETCh?` to transfer a measurement result from memory to the output buffer. Refer to individual commands in the MEASure subsystem for more information.

Example:

```
INIT:IMM
```

Abort the Sweep or Measurement (Remote Command Only)

Stops any sweep or measurement in progress and resets the sweep or trigger system. A measurement refers to any of the measurements found in the **MEASURE** menu. If the trigger conditions are met, another sweep is initiated immediately.

If `:INITiate:CONTinuous` is off (single measure), then `:INITiate:IMMediate` will start a new single measurement.

If `:INITiate:CONTinuous` is on (continuous measure), a new continuous measurement begins immediately.

The INITiate and/or TRIGger subsystems contain additional related commands.

Remote Command:

`:ABORt`

Remote Command Notes:

In the continuous measurement mode, the Restart key is equivalent to `ABORt`.

Example:

ABOR

14
Measure (Spectrum Analysis Mode)

In the Spectrum Analysis mode (see the Mode key), this key displays a menu that lets you make transmitter power measurements such as adjacent channel power, occupied bandwidth, and harmonic distortion measurements. If other modes are available and have been selected, the measurements for that particular mode will be displayed.

Use Meas Ctrl to pause and resume the currently selected measurement and to select between continuous or single measurements.

Command Interactions: MEASure, CONFigure, FETCh, INITiate and READ

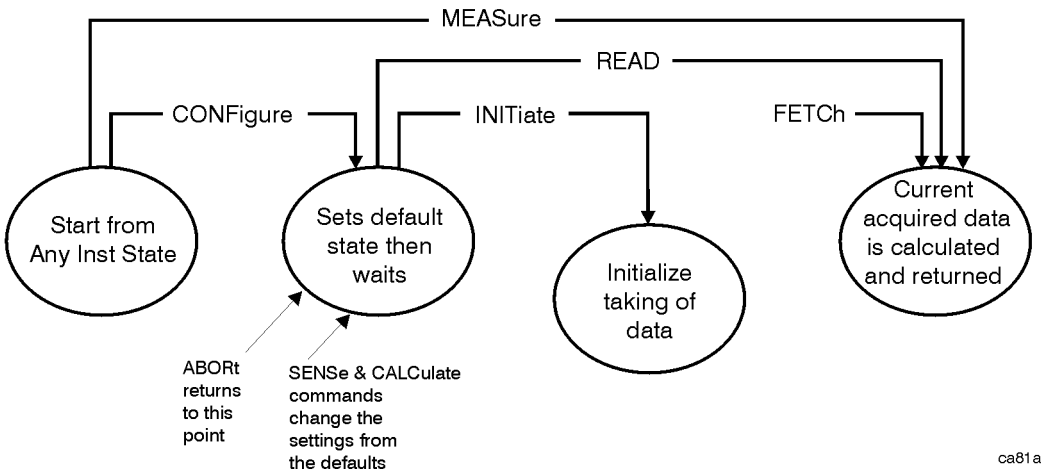


Figure 2 Measurement Group of Commands

Measure Commands:

`:MEASure:<measurement>[n]?`

This is a fast single-command way to make a measurement using the factory default instrument settings. These are the settings and units that conform to the Mode Setup settings (that is, radio standard) that you have currently selected.

- Stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory defaults.
- Initiates the data acquisition for the measurement.
- Blocks other SCPI communication, waiting until the measurement is complete before returning results.
- If the function does averaging, it is turned on and the number of averages is set to 10.
- After the data is valid it returns the scalar results, or the trace data, for the specified measurement. The type of data returned may be defined by an [n] value that is sent with the command.

The scalar measurement results will be returned if the optional [n] value is not included, or is set to 1. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available.

ASCII is the default format for the data output. Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the `FORMat:DATA` command for more information.

If you need to change some of the measurement parameters from the factory default settings you can set up the measurement with the `CONFigure` command. Use the commands in the `SENSe:<measurement>` and CALCulate:<measurement> subsystems to change the settings. Then you can use the `READ?` command to initiate the measurement and query the results. See Figure 2.

If you need to repeatedly make a given measurement with settings other than the factory defaults, you can use the commands in the `SENSe:<measurement>` and `CALCulate:<measurement>` subsystems to set up the measurement. Then use the `READ?` command to initiate the measurement and query results.

Measurement settings persist if you initiate a different measurement and then return to a previous one. Use `READ:<measurement>?` if you want to use those persistent settings. If you want to go back to the default settings, use `MEASure:<measurement>?`.

Configure Commands:

`:CONFigure:<measurement>`

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory default instrument settings. It sets the instrument to single measurement mode but should not initiate the taking of measurement data unless `INIT:CONTinuous` is ON. After you change any measurement settings, the `READ` command can be used to initiate a measurement without changing the settings back to their defaults. In Spectrum Analysis mode the `CONFigure` command also turns the averaging function on and sets the number of averages to 10 for all measurements.

The `CONFigure?` query returns the current measurement name.

Fetch Commands:

:FETCh:<measurement>[n]?

This command puts selected data from the most recent measurement into the output buffer. Use FETCh if you have already made a good measurement and you want to return several types of data (different [n] values, for example, both scalars and trace data) from a single measurement. FETCh saves you the time of re-making the measurement. You can only FETCh results from the measurement that is currently active, it will not change to a different measurement.

If you need to get new measurement data, use the READ command, which is equivalent to an INITiate followed by a FETCh.

The scalar measurement results will be returned if the optional [n] value is not included, or is set to 1. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used for handling large blocks of data since they are smaller and transfer faster then the ASCII format. (FORMat:DATA)

FETCh may be used to return results other than those specified with the original READ or MEASure command that you sent.

INITiate Commands:

:INITiate:<measurement>

This command is not available for measurements in all the instrument modes:

- Initiates a trigger cycle for the specified measurement, but does not output any data. You must then use the FETCh<meas> command to return data. If a measurement other than the current one is specified, the instrument will switch to that measurement and then initiate it.

  For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. If you send INIT:ACP? it will change from channel power to ACP and will initiate an ACP measurement.
- Does not change any of the measurement settings. For example, if you have previously started the ACP measurement and you send INIT:ACP? it will initiate a new ACP measurement using the same instrument settings as the last time ACP was run.
- If your selected measurement is currently active (in the idle state) it triggers the measurement, assuming the trigger conditions are met. Then it completes one trigger cycle. Depending upon the measurement and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle. It also holds off additional commands on GPIB until the acquisition is complete.

READ Commands:

:READ:<measurement>[n]?

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP measurement and you send READ:ACP? it will initiate a new measurement using the same instrument settings.
- Initiates the measurement and puts valid data into the output buffer. If a measurement other than the current one is specified, the instrument will switch to that measurement before it initiates the measurement and returns results.

  For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. Then you send READ:ACP? It will change from channel power back to ACP and, using the previous ACP settings, will initiate the measurement and return results.
- Blocks other SCPI communication, waiting until the measurement is complete before returning the results

  If the optional [n] value is not included, or is set to 1, the scalar measurement results will be returned. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used when handling large blocks of data since they are smaller and faster then the ASCII format. (FORMat:DATA)

Current Measurement Query (Remote Command Only)

Returns the name of the measurement that is currently running.

Remote Command:

```
:CONFigure?
```

Example:

```
CONF?
```

Test Current Results Against all Limits (Remote Command Only)

Allows you to check the status of the fail flag. This will return true (non-zero) if the flag is set to FAIL. A false (zero) is returned if the flag is set to TRUE. The fail flag is updated after every sweep.

This flag is only used by Channel Power (DVD-T radio standards only), Adjacent Channel Power, Multi-Carrier Power, Spurious Emissions, and SEM. For all other measurements, the fail flag will not be displayed and the SCPI command will return 0.

Remote Command:

```
:CALCulate:CLIMits:FAIL?
```

Example:

```
CALC:CLIM:FAIL?
```

Meas Off

Accesses the core spectrum analysis measurement functionality. It turns off the current one-button measurement so there are no keys available in the Meas Setup menu.

Key Path: MEASURE

Saved State: Saved in state

Factory Preset: Meas Off is selected.

Remote Command:

```
:CONFigure:SANalyzer
```

Example:

```
CONF:SAN
```

Channel Power

Channel Power measures the power and power spectral density in the channel bandwidth that you specify. One marker pair on the display indicates the edges of the channel bandwidth. The center frequency, reference level, and channel bandwidth must be set by the user. For more information see"Meas Setup (Channel Power—CHP)" on page 270.

You can configure measurement settings by pressing Meas Setup after selecting Channel Power. You can make a measurement in single or continuous sweep mode. Pressing Meas Control enables you to pause or restart a measurement, or toggle between continuous and single measurement. To set Ref Level automatically, use Meas Setup, Optimize Ref Level.

The power calculation method used to determine the channel power is a traditional method known as the integration bandwidth (IBW) method. A swept spectrum is used as the basis for this calculation. Therefore, it is important to set the resolution bandwidth correctly before making this measurement using the following formula:

$$RBW = k(span)/n$$

Where k is a value between 1.2 and 4.0 and n is the number of trace points.

NOTE Because of the noise-like nature of the signals being measured, the video bandwidth should be ≥ 10 times the resolution bandwidth.

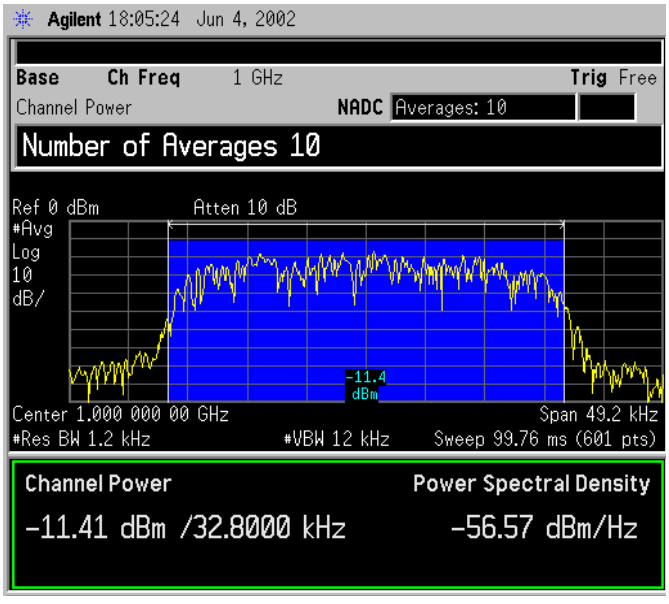


Figure 3 Channel Power Measurement Results

NOTE The displayed trace is the current trace, not the averaged trace.

Pressing **Meas Setup** after **Channel Power** has been selected will access the channel power measurement setup menu. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** after **Channel Power** has been selected will access the channel power measurement control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

When a DVB-T radio standard is selected, this measurement will also compare the input signal against a predefined spectrum mask. The mask amplitudes defined in the DVB-T specification (ETSI EN 300 744 V1.4.1) range from 0 dB to 100 dB. This is for power measured in a 4 kHz bandwidth therefore an adjustment to these values will need to be made as the measurement is made in a 7.61MHz bandwidth.

The measurement makes two sweeps, one in a 4 kHz bandwidth and one in a 7.61 MHz bandwidth, then computes the difference between the two. This value will be used to adjust the mask settings. As this value is calculated as part of the measurement setup, it is expected that the DVB-T signal to be measured will be present prior to the standard being selected. The mask will be positioned relative to the power measured in the 7.61 MHz bandwidth. The pass/fail indicator will be used to determine if the input signal exceeds the mask or not.

If the current span setting is narrower than the mask width, the mask will not be displayed and the message 10191 displayed in error queue. Increase the span to at least the mask width to display the mask. When the mask is not displayed, the pass/fail functionality will not be executed therefore no pass/fail flag will be displayed.

To ensure accuracy this measurement requires a specific minimum Sweep Point to Span ratio. This is calculated using; Sweep Points = Span / (Closest Mask Breakpoint / 2), then round it off.

For DVB-T measurements using 24 MHz Span, the number of Sweep Points is 2001. If the Sweep Point to Span ratio is changed to a value less than the value obtained using the above algorithm, the message 10192 is then displayed, although the measurement is still made using the new sweep point to span ratio.

Key Path: MEASURE

Remote Command:

Measurement Results Available	
Command	**Results Returned**
:CONFigure:CHPower :INITiate:CHPower	Not Applicable
:FETCh:CHPower? :MEASure:CHPower? :READ:CHPower?	Returns two values that correspond to the Channel Power and Power Spectral Density.
:FETCh:CHPower:CHPower? :MEASure:CHPower:CHPower? :READ:CHPower:CHPower?	Returns a single value that corresponds to the Channel Power.
:FETCh:CHPower:DENSity? :MEASure:CHPower:DENSity? :READ:CHPower:DENSity?	Returns a single value that corresponds to the Power Spectral Density.

Remote Command Notes:

The main channel power is returned in the current amplitude units, and the density value is returned in current amplitude units/Hz

Example:

`FETC:CHP?` or `MEAS:CHP?` or `READ:CHP?` command returns scalar results of main channel power and power density.

`FETC:CHP:CHP?` or `MEAS:CHP:DENS?` or `READ:CHP:DENS?` commands will return the single scalar result specified.

Occupied BW

Occupied Bandwidth integrates the power of the displayed spectrum and puts markers at the frequencies between which a selected percentage of the power is contained. The measurement defaults to 99% of the occupied bandwidth power. The power-bandwidth routine first computes the combined power of all signal responses contained in the trace. For 99% occupied power bandwidth, markers are placed at the frequencies on either side of 99% of the power. 1% of the power is evenly distributed outside the markers. The difference between the marker frequencies is the 99% power bandwidth and is the value displayed. For more information see "Meas Setup (Occupied Bandwidth—OBW)" on page 278.

The occupied bandwidth function also indicates the difference between the analyzer center frequency and the center frequency of the channel. This "Transmit Freq Error" is defined as the difference between the $(f_1 + f_2)/2$ and the tuned center frequency of the signal. See Figure 4 on page 243.

The occupied bandwidth measurement can be made in single or continuous sweep mode. The center frequency, reference level, and channel spacing must be set by the user.

To configure measurement settings, press **Meas Setup** after selecting **Occupied BW**. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** enables you to pause or restart a measurement, or toggle between continuous and single measurement.

Key Path: MEASURE

Remote Command:

Measurement Results Available	
Command	**Results Returned**
:CONFigure:OBW :INITiate:OBW	Not Applicable
:FETCh:OBW? :MEASure:OBW? :READ:OBW?	Returns two values that correspond to the Occupied BW and Transmit Frequency Error in Hertz.
:FETCh:OBW:OBWidth? :MEASure:OBW:OBWidth? :READ:OBW:OBWidth?	Returns a single value that corresponds to the Occupied BW in Hertz.
:FETCh:OBW:FERRor? :MEASure:OBW:FERRor? :READ:OBW:FERRor?	Returns a single value that corresponds to the Transmit Frequency Error in Hertz.
:FETCh:OBW:XDB? :MEASure:OBW:XDB? :READ:OBW:XDB?	Returns a single value that corresponds to the x dB BW in Hertz.

Remote Command Notes:

The results for both values are returned in Hz.

Example:

`FETC:OBW?` or `MEAS:OBW?` or `READ:OBW?` command returns scalar results of occupied bandwidth and transmit frequency error.

`FETC:OBW:FERR?` or `MEAS:OBW:FERR?` or `READ:OBW:FERR?` commands will return the single scalar result specified.

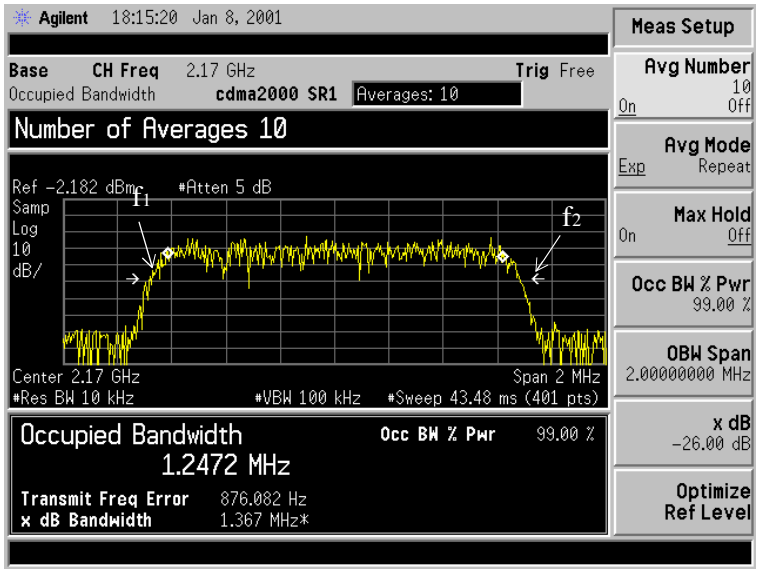


Figure 4 Occupied Bandwidth Measurement Results

Adjacent Channel Power—ACP

Adjacent Channel Power (ACP) is a measure of the power that leaks into adjacent transmit channels. Depending on the radio standard selected from the Mode Setup menu, this measurement can run in several different modes in order to measure different types of signals. For more information see "Meas Setup (Adjacent Channel Power—ACP)" on page 287.

ACP measures the power present in adjacent transmit channels. The span is set according to the six available offsets and their associated integration bandwidths defined by you or the selected radio standard (**Mode Setup, Radio Std**). The root-raised cosine filter also affects the span and is only available for NADC, 3GPP W-CDMA, and TETRA radio standards.

- When Method is set to IBW, one sweep of the trace will be taken, and the band power for each offset will be computed. Results will be displayed relative to the total power or the power spectral density, depending on your selection after pressing Meas Setup, Meas Type. You may view the results as the current trace, bar graph, or a combination.
- When Method is set to RBW, the main channel and offsets will be measured in zero span and the combined results reported according to the Meas Type selection.
- When Method is set to Fast, the five point ACLR measurement method is used for improved speed of making ACP measurements. Fast is only enabled for the 3GPP W-CDMA radio standard only.

The measurement settings may be configured by pressing **Meas Setup** after **ACP** has been selected. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** allows you to pause or restart your measurement, or toggle between continuous and single measurement mode.

Key Path: MEASURE

Remote Command:

Measurement Results Available

Command	n	Condition	Results Returned
:CONFigure:ACP :INITiate:ACP			Not Applicable
:FETCh:ACP[n]? :MEASure:ACP[n]? :READ:ACP[n]?	not specified, or n=1	Any Meas Type Radio Std = None Only one offset A is on	Returns 3 comma-separated values that correspond to: main channel power, lower-adjacent channel power (dBc), and upper-adjacent channel power (dBc).

Measurement Results Available (continued)

Command	n	Condition	Results Returned
	not specified, or n=1	Meas Type = Total Power Reference Method = IBW or RBW	Returns 28 comma-separated values, in the following order: Center Frequency - relative power (dB) Center Frequency - absolute power (dBm) Center Frequency - relative power (dB) Center Frequency - absolute power (dBm) Negative Offset Frequency (1) - relative power (dB) Negative Offset Frequency (1) - absolute power (dBm) Positive Offset Frequency (1) - relative power (dB) Positive Offset Frequency (1) - absolute power (dBm) ... 25. Negative Offset Frequency (6) - relative power (dB) 26. Negative Offset Frequency (6) - absolute power (dBm) 27. Positive Offset Frequency (6) - relative power (dB) 28. Positive Offset Frequency (6) - absolute power (dBm) The center frequency relative power is relative to the center frequency absolute power, and therefore is always equal to 0.00 dB.
	not specified, or n=1	Meas Type = Total Power Reference Method = Fast	Returns 5 comma-separated values, in the following order: Main Carrier- absolute power (dBm) Negative Offset Frequency (1) - absolute power (dBm) Positive Offset Frequency (1) - absolute power (dBm) Negative Offset Frequency (2) - absolute power (dBm) Positive Offset Frequency (2) - absolute power (dBm)

Measurement Results Available (continued)

Command	n	Condition	Results Returned
	not specified, or n=1	Meas Type = Power Spectral Density Reference	Returns 28 comma-separated values, in the following order: Center Frequency - relative power (dB) Center Frequency - absolute power (dBm/Hz) Center Frequency - relative power (dB) Center Frequency - absolute power (dBm/Hz) Negative Offset Frequency (1) - relative power (dB) Negative Offset Frequency (1) - absolute power (dBm/Hz) Positive Offset Frequency (1) - relative power (dB) Positive Offset Frequency (1) - absolute power (dBm/Hz) ... 25. Negative Offset Frequency (6) - relative power (dB) 26. Negative Offset Frequency (6) - absolute power (dBm/Hz) 27. Positive Offset Frequency (6) - relative power (dB) 28. Positive Offset Frequency (6) - absolute power (dBm/Hz) The center frequency relative power is relative to the center frequency absolute power, and therefore is always equal to 0.00 dB.

Remote Command Notes:

The main channel power is returned in the current amplitude units, and the lower and upper channel results are always returned in dB.

Example:

`FETC:ACP?` or `MEAS:ACP?` or `READ:ACP?` commands return the scalar results of main channel power, lower channel power (relative), and upper channel power (relative) if only one offset is set to on and the Radio Standard is set to None. Otherwise, 28 values are returned. If Meas Type is Total Power Ref, these are the main channel power in dBm and in dBc from the carrier (0 dBc) each repeated, followed by the absolute and relative power levels for each lower and upper offset if Meas Type is Total Power Ref. Otherwise they are

the main channel power spectral density and relative power spectral density (0 dB) each repeated. Then followed by the absolute and relative spectral density values for each lower and upper offset.

Multi-Carrier Power

Multi-Carrier Power is the measure of the power that leaks into adjacent transmit channels when two or more carriers are present. The results reported are identical to the adjacent power measurement, but the setup is different to allow for two or more carriers. For more information see "Meas Setup (Multi-Carrier Power—MCP)" on page 307.

The measurement settings may be configured by pressing Meas Setup after Multi-Carrier Power has been selected. Pressing Meas Control allows you to pause or restart your measurement, or toggle between continuous and single measurement mode.

Key Path: MEASURE

Remote Command:

Measurement Results Available

Command	n	Results Returned
:CONFigure:MCPower	N/A	Not Applicable
:FETCh:MCPower[n]? :MEASure:MCPower[n]? :READ:MCPower[n]?	n=1 (or not specified)	Returns 20 comma-separated scalar results, in the following order. **1** 0.0 **2** Total carrier power (dBm) **3** 0.0 **4** Reference carrier power (dBm) **5** lower 5 MHz offset - relative power (dBc) **6** lower 5 MHz offset - absolute power (dBm) **7** upper 5 MHz offset - relative power (dBc) **8** upper 5 MHz offset - absolute power (dBm) **9** lower 10 MHz offset - relative power (dBc) **10** lower 10 MHz offset - absolute power (dBm) **11** upper 10 MHz offset - relative power (dBc) **12** upper 10 MHz offset - absolute power (dBm) **13** lower 15 MHz offset - relative power (dBc) **14** lower 15 MHz offset - absolute power (dBm) **15** upper 15 MHz offset - relative power (dBc) **16** upper 15 MHz offset - absolute power (dBm) **17** NaN returned **18** NaN returned **19** NaN returned **20** NaN returned If the results are not available, –999.0 is returned.
	n=2...13	Returns absolute and relative values for carrier n-1. If results are not available –999.0 is returned

Measurement Results Available (continued)		
Command	**n**	**Results Returned**
	n=14	Returns 36 comma-separated scalar results, in the following order. • 1 to 24. All carriers absolute and relative values • 25. lower offset A - relative power (dBc) • 26. lower offset A - absolute power (dBm) • 27. upper offset A - relative power (dBc) • 28. upper offset A - absolute power (dBm) • 29. lower offset B - relative power (dBc) • 30. lower offset B - absolute power (dBm) • 31. upper offset B - relative power (dBc) • 32. upper offset B - absolute power (dBm) • 33. lower offset C - relative power (dBc) • 34. lower offset C - absolute power (dBm) • 35. upper offset C - relative power (dBc) • 36. upper offset C - absolute power (dBm) If the results are not available, –999.0 is returned.

Example:

`FETC:MCP?` or `MEA:MCP?` or `READ:MCP?`

Power Stat CCDF

The CCDF measurement is a statistical measurement of a high-level signal or peak power. It shows in both graphical and tabular form for what percentage of the time a signal exceeds its average power, and by how much this average is exceeded. For more information see "Meas Setup (Power Stat Complementary Cumulative Distribution Function—CCDF)" on page 327.

For each single sweep of this measurement, the average power is defined by:

$$Pavg = \left(\sum_{1}^{n} (V^2/Z_0) \right) / n$$

where V is the envelope voltage, Z_0 is the characteristic impedance, and n is the number of samples (32k maximum).

Pavg is used as a guideline to define the probability of the samples, which is x dB above the average power. The number of samples collected per sweep depends upon the sampling rate and the setting of the measurement interval. Multiple sweeps may be required if the sample number exceeds the number of samples collected per sweep. The results and the CCDF curve are updated after each sweep.

Results from a 2.17 GHz 3GPP W-CDMA input signal are shown below in Figure 5.

It is important to set the correct center frequency before initiating this measurement.

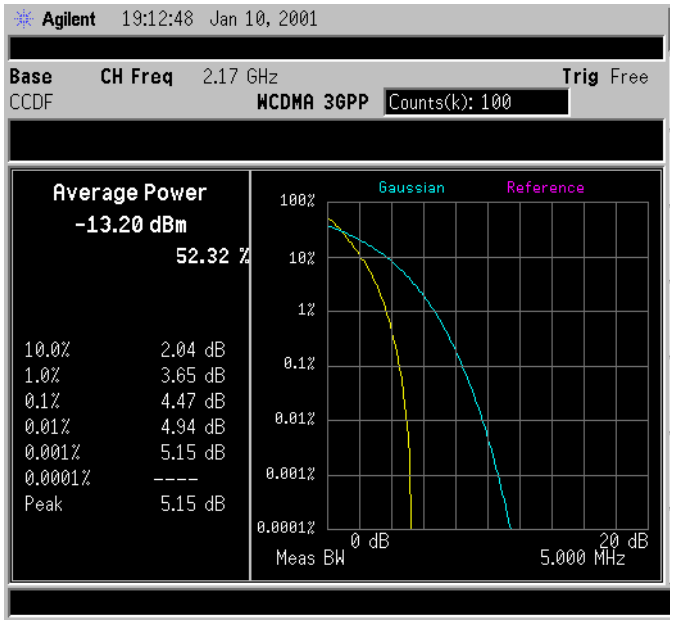


Figure 5 Power Stat CCDF Measurement Results

Pressing **Meas Setup** after **Power Stat CCDF** has been selected will access the **Power Stat CCDF** measurement setup menu. The factory defaults provide a good starting point for this measurement. The settings are adjustable, however, to meet specific requirements. Pressing **Radio Standard** after **Mode Setup** has been selected will access all the Radio Standards available for which this measurement can be applied. Pressing **Meas Control** after **Power Stat CCDF** has been selected will access the **Power Stat CCDF** measurement control menu which allows you to pause or restart your measurement, or toggle between continuous and single measurement.

Key Path: MEASURE

Remote Command:

Measurement Results Available

Command	n	Results Returned
:CONFigure:PSTatistic	N/A	Not Applicable
:FETCh:PSTatistic[n]? :MEASure:PSTatistic[n]? :READ:PSTatistic[n]?	n=1 (or not specified)	Returns 10 scalar results, in the following order. **1** Average input power (in dBm) **2** Probability at the average input power (in%) **3** Power level that has 10% of the power **4** Power level that has 1% of the power **5** Power level that has 0.1% of the power **6** Power level that has 0.01% of the power **7** Power level that has 0.001% of the power **8** Power level that has 0.0001% of the power **9** Peak power (in dB) **10** Count
	n=2	Returns a series of 501 floating point numbers (in percent) that represent the current measured power statistics trace. This is the probability at specific power levels (average power), in the following order: **1** 1. Probability at 0 dB power **2** 2. Probability at 0.1 dB power **3** 3. Probability at 0.2 dB power … **4** 501. Probability at 50.0 dB power
	n=3	Returns a series of 501 floating point numbers (in percent) that represent the Gaussian trace. This is the probability at specific power levels (average power), in the following order: **1** Probability at 0 dB power **2** Probability at 0.1 dB power **3** Probability at 0.2 dB power … **4** 501. Probability at 50.0 dB power

Measurement Results Available (continued)		
Command	**n**	**Results Returned**
	n=4	Returns a series of 501 floating point numbers (in percent) that represent the user-definable reference trace. This is the probability that at specific power levels (average power) will occur, as follows: • Probability at 0 dB power • Probability at 0.1 dB power • Probability at 0.2 dB power • ... • 501. Probability at 50.0 dB power

Remote Command Notes:

To save trace data use the fetch methods shown above.

Example:

```
FETC:PST? or MEAS:PST? or READ:PST?
FETC:PST2? or MEAS:PST2? or READ:PST2?
FETC:PST3? or MEAS:PST3? or READ:PST3?
```

Harmonic Distortion

The range table state determines which harmonics are to be measured. If **Range Table** is set to **Off**, for each harmonic to be measured, the center frequency will be set to the appropriate integer multiple of the fundamental frequency and a sweep taken. The amplitude is calculated by averaging the power in the trace and is displayed in the results table in the results window. The desired Res BW value for each harmonic is calculated by multiplying the harmonic number with the Res BW of the fundamental. This results in the smallest Res BW available being used that is greater than or equal to the computed value. If a Res BW greater than the instrument maximum is calculated then the maximum Res BW of the instrument is used and an asterisk (*) is displayed after the amplitude result of the harmonic to indicate that the desired Res BW was not used. The span for each harmonic is set to zero.

If **Range Table** is set to **On**, for each range enabled after the fundamental, the center frequency will be set to the frequency of each range. If the current span is set to zero, the amplitude is calculated by averaging the power in the trace and is displayed in the results table in the results window. If the range has a non-zero span, the amplitude is calculated by making a band-power measurement over the span and is displayed in the results table in the results window.

After the specified number of harmonics have been measured and their amplitudes displayed, the total harmonic distortion is computed and displayed in the left-hand portion of the window (view is set to Harmonics & THD). If the measurement is in single mode, the display will remain at the last harmonic setting and the analyzer sweep will be stopped. If the measurement is in continuous mode, the measurement will continually measure the amplitude of the fundamental and harmonics.

For averaged measurements, you may specify the number of sweeps over which the amplitude of each harmonic is measured. This means that if the Avg Number is set to 10, ten sweeps will be taken and averaged for each harmonic to be measured. The total harmonic distortion would then be calculated from these averaged amplitude readings. Note that averaging applies only to the amplitude of the harmonic, and does not affect the frequency at which the amplitude is measured.

Key Path: MEASURE

Dependencies/Couplings: This measurement is not available when using external mixing.

Remote Command:

Measurement Results Available		
Command	**n**	**Results Returned**
:CONFigure:HARMonics :INITiate:HARMonics	N/A	Not Applicable

Measurement Results Available		
Command	**n**	**Results Returned**
:FETCh:HARMonics:AMPLitude:ALL? :MEASure:HARMonics:AMPLitude:ALL? :READ:HARMonics:AMPLitude:ALL?	N/A	Returns the amplitude values of the first ten harmonics. The first value (for the fundamental) is measured in dBm. The remaining harmonics are measured in dBm from the fundamental. If fewer than ten harmonics are measured, zero is returned for any harmonic not measured.
:FETCh:HARMonics:AMPLitude[n]? :MEASure:HARMonics:AMPLitude[n]? :READ:HARMonics:AMPLitude[n]?	n=1 to 10 (n=1 for n not specified)	Returns the amplitude of the specified harmonic number n, where n=1 returns the amplitude of the fundamental in units of dBm. For example, n = 9 returns the amplitude of the ninth harmonic measured in dBm from the fundamental.
:FETCh:HARMonics[:DISTortion]? :MEASure:HARMonics[:DISTortion]? :READ:HARMonics[:DISTortion]?	N/A	Returns the computed total harmonic distortion as a percentage.
:FETCh:HARMonics:FREQuency:ALL? :MEASure:HARMonics:FREQuency:ALL? :READ:HARMonics:FREQuency:ALL?	N/A	Returns the frequency values of the first ten harmonics, in Hz. The first harmonic is the fundamental. If fewer than ten harmonics are measured, zero is returned for any harmonic not measured.
:FETCh:HARMonics:FREQuency[n]? :MEASure:HARMonics:FREQuency[n]? :READ:HARMonics:FREQuency[n]?	n=2 to 10 (n=1 for n not specified)	Returns the frequency of the specified harmonic number N (in Hz).
:FETCh:HARMonics:FUNDamental? :MEASure:HARMonics:FUNDamental? :READ:HARMonics:FUNDamental?	N/A	Returns the frequency of the fundamental, measured in Hz.
:FETCh:HARMonics[n]? :MEASure:HARMonics[n]? :READ:HARMonics[n]?	n=1 to 2 (n=1 for n not specified)	These commands return the power of the spurious emissions at the selected harmonic frequencies of the current channel frequency using the selected resolution bandwidth filter. You can set the number of harmonics to be measured. For each harmonic, the reference level is set 40 dB above the largest amplitude limit with input attenuation held constant. The attenuation is set to limit the carrier (fundamental) power at the spectrum analyzer input mixer to the value determined by Max Mixer Lvl. not specified or n=1 Returns one value that corresponds to the total harmonic distortion (RMS voltage %). n=2 Returns one value that corresponds to the total harmonic distortion (dB).

Example:

```
FETC:HARM:AMPL:ALL?
```

`MEAS:HARM:AMPL2?` returns the amplitude of the second harmonic measured in dBc from the fundamental.

`READ:HARM:FREQ10` returns the frequency of the tenth harmonic in Hz.

Burst Power

The burst power measurement is an accurate method of determining the average power for the specified burst. Burst power measures the average power in zero-span mode for the captured burst. This measurement is primarily for use with time domain modulated signals (Bluetooth™, GSM /Edge, and NADC). The burst width, if not user defined, is determined by finding the peak in the captured data, then searching for the first place that the trace is higher than the threshold level. This is considered to be the start of the burst. The stop of the burst is the first position in the trace that falls below the threshold level. The mean carrier power is calculated based on the burst width and the threshold level. Refer to the following figure for clarification of these parameters.

The burst power measurement acquires data from the "Measured Area" above when a radio standard is chosen and when Meas Setup, Meas Method, Measured Burst Width is selected. When Meas Setup, Meas Method, Above Threshold Lvl is selected, the "Measured Area" extends the burst width delimiter lines to the start and stop points.

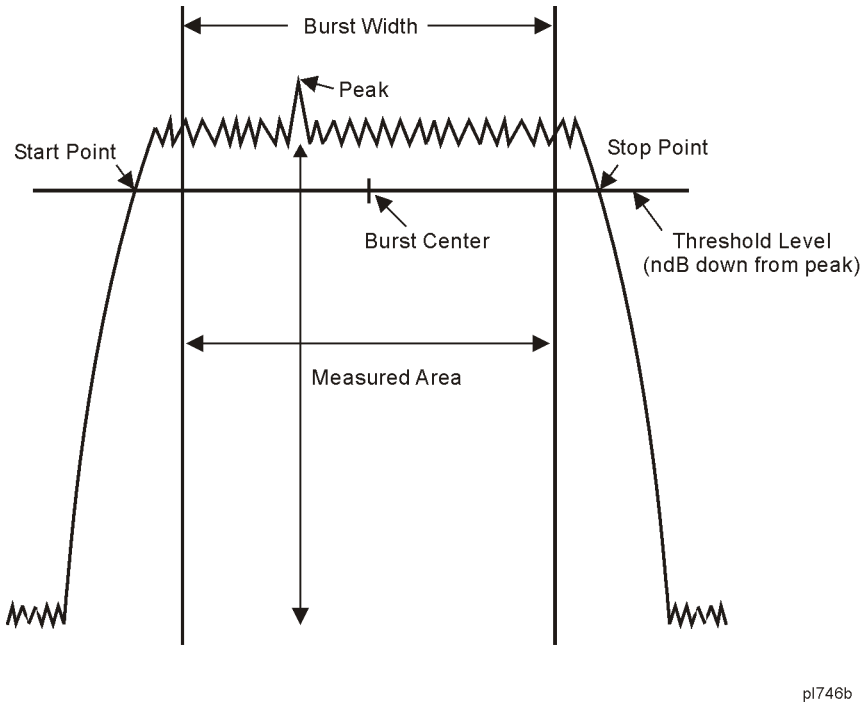


Figure 6 Burst Power Measurement

The mean carrier power is calculated by:

converting each trace point amplitude from dBm into linear power

adding the above amplitudes together and dividing by the number of points included in the average.

This value is then displayed in logarithmic form (dBm).

$$(Pavg) = 10 \log 10 \left\{ \frac{\left(\sum_{n}^{m} \left(10^{\frac{p}{10}} \right) \right)}{m - n} \right\}$$

where Pavg = average power, n is the start trace point, m= the stop trace point, and p= the trace point amplitude power in dBm.

Figure 7 shows an example of the results obtained when measuring a Bluetooth™ signal and with a user-defined burst width.

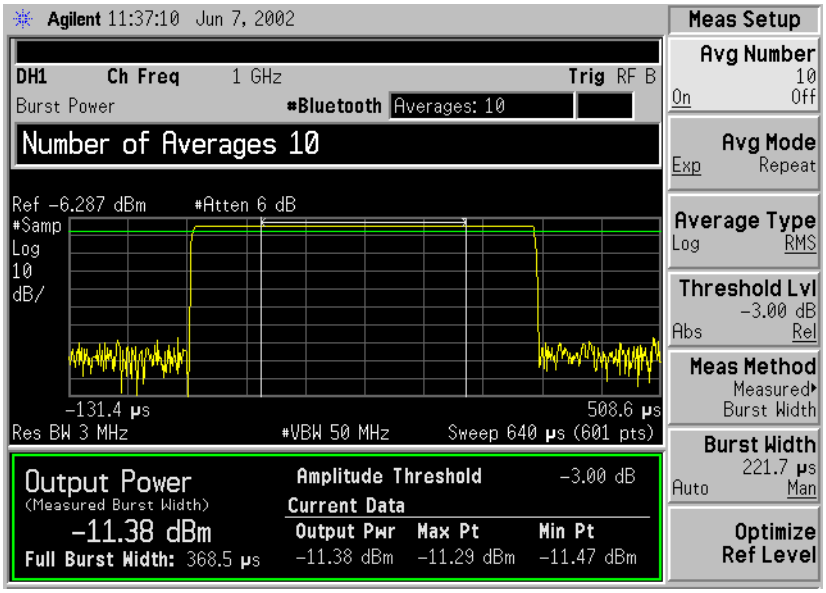


Figure 7 Burst Power Measurement Results

The analyzer defaults to zero-span mode and the sweep time is set to capture at least one burst. The sweep time can be changed by pressing Sweep, Sweep Time.

Pressing Meas Setup after Burst Power has been selected displays the burst power measurement setup menu. Pressing Meas Control after Burst Power has been selected displays the burst power control menu, where you can pause or restart a measurement, or toggle between continuous and single measurement.

Key Access: MEASURE

The measurements described above are those available in SA mode (see Mode key). Other measurements are available in other modes if an optional personality is installed.

Key Path: MEASURE

Remote Command:

Measurement Results Available		
Command	**n**	**Results Returned**
:CONFigure:BPOWer :INITiate:BPOWer	N/A	Not Applicable
:FETCh:BPOWer[n]? :MEASure:BPOWer[n]? :READ:BPOWer[n]?	n=1 (or not specified)	Returns 10 scalar results, in the following order. Sample time Power (RMS of carrier power) Power averaged Number of samples, Amplitude threshold (relative) Maximum trace point on the measured part of the burst. Minimum trace point on the measured part of the burst. Burst width (actual measured width, using the threshold level) Measured time Measured points
	n=2	Returns the displayed RF envelope trace data separated by commas. The number of data values is determined by the setting of the trace points parameter.

Example:

```
FETC:BPOW? or MEAS:BPOW? or READ:BPOW?
```

Intermod (TOI)

The third order intermodulation (TOI) measurement computes and displays the output intercept point (IP3), and places markers upon the trace to indicate the measured signals and third-order products. For more information see "Meas Setup (Intermod (TOI))" on page 353.

Key Path: MEASURE

Remote Command:

Measurement Results Available

Command	n	Results Returned
:CONFigure:TOI :INITiate:TOI	n/a	Not Applicable
:FETCh:TOI[n]? :MEASure:TOI[n]? :READ:TOI[n]?	n=1 or not specified	Returns 6 scalar results, in the following order. The worst case Output Intercept Power value in dBm. The worst case Output Intermod Point in Hz The lower Output Intercept Power value in dBm The lower Output Intermod Point in Hz The upper Output Intercept Power value in dBm The upper Output Intermod Point in Hz
	n=2	Returns 12 scalar results, in the following order. The worst case Output Intermod Point value in Hz. The worst case Output Intermod Power value in dBm. The worst case Output Intercept Power value in dBm The lower base frequency value in Hz The lower base power value in dBm The upper base frequency value in Hz The upper base power value in dBm The lower Output Intermod Point in Hz The lower Output Intermod Power value in dBm The lower Output Intercept Power value in dBm The upper Output Intermod Point in Hz The upper Output Intermod Power value in dBm The upper Output Intercept Power value in dBm
:FETCh:TOI:IP3? :MEASure:TOI:IP3? :READ:TOI:IP3?	n=1 or not specified	Returns the worst case Output Intercept Power value in dBm.

Example:

```
FETC:TOI2? or MEAS:TOI2? or READ:TOI2?

FETC:TOI:IP3? or MEAS:TOI:IP3? or READ:TOI:IP3?
```

Spurious Emissions

The spurious emissions measurement identifies and determines the power level of spurious emissions in certain frequency bands. For more information see "Meas Setup (Spurious Emissions)" on page 359.

Key Path: MEASURE

Remote Command:

Command	n	Results Returned
:CONFigure:SPURious :INITiate:SPURious	n/a	Not applicable
:FETCh:SPURious[n]? :MEASure:SPURious[n]? :READ:SPURious[n]?	n=1 (or not specified)	Returns a variable-length list of values containing detailed spur information. The total number of data values returned is (1 + 6x spurs), where x is the number of spurs identified. You can have up to 121 data entries if you have the maximum 20 spurs identified. The values returned are in the following order: Number of spurs in items 2 through 6 in this list [Repeat the following for each spur] Spur number Range number in which spur was located (integer) Frequency of spur (Hz) Amplitude of spur (dBm) Absolute limit (dBm) Pass or Fail (1|0)
	n=2 through 21	Returns Detector 1 trace data values for the selected frequency range (where range number = n – 1). If the selected range is not active, then 9.91E37 is returned for each non-active trace data element.
	n=22	Returns the number of spurs found.
	n=23 through 42	Returns Detector 2 trace data values for the selected frequency range (where range number = n – 22). If selected range is not active, then 9.91E37 is returned for each trace data element.

Example:

```
MEAS:SPUR?
```

Spectrum Emission Mask

The Spectrum Emission Mask measurement includes the in-band and out-of-band spurious emissions. As it applies to W-CDMA (3GPP), this is the power contained in a specified frequency bandwidth at certain offsets relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band. For WLAN, the reference power is taken as the peak PSD in the signal, and all offset results are also the peak PSD in that offset as opposed to the integrated power.

Offsets that are turned off (inactive) will return –999.0 when their results are queried over SCPI.

For more information see "Meas Setup (Spectrum Emissions Mask—SEM)" on page 381.

Key Path: MEASURE

Remote Command:

Measurement Results Available

Command / Condition	n	Results Returned
:CONFigure:SEMask :INITiate:SEMask	N/A	Not Applicable
:FETCh:SEMask[n]? :MEASure:SEMask[n]? :READ:SEMask[n]? Using Total Power Reference	n=1 (or not specified)	Returns 60 comma-separated scalar results, in the following order (70 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Absolute power at the center frequency (reference) area (dBm) 3. Reserved for the future use, returns –999.0 4. Reserved for the future use, returns –999.0 5. Reserved for the future use, returns –999.0 6. Reserved for the future use, returns –999.0 7. Reserved for the future use, returns –999.0 8. Reserved for the future use, returns –999.0 9. Reserved for the future use, returns –999.0 10.Reserved for the future use, returns –999.0. 1.Relative power on the negative offset A (dBc) 12.Absolute power on the negative offset A (dBm) 13.Relative peak power on the negative offset A (dBc) 14.Absolute peak power on the negative offset A (dBm) 15.Peak frequency in the negative offset A (Hz) 16.Relative power on the positive offset A (dBc) 17.Absolute power on the positive offset A (dBm) 18.Relative peak power on the positive offset A (dBc)119.Absolute peak power on the positive offset A (dBm) 20.Peak frequency in the positive offset A (Hz)

Measurement Results Available (continued)

Command / Condition	n	Results Returned
:FETCh:SEMask[n]? :MEASure:SEMask[n]? :READ:SEMask[n]? Using Total Power Reference	n=1 (or not specified)	21.Relative power on the negative offset B (dBc) ... 59.Absolute peak power on the positive offset E (dBm) 60.Peak frequency in the positive offset E (Hz) If offset F is active: 61.Relative power on the negative offset F (dBc) 62.Absolute power on the negative offset F (dBm) 63.Relative peak power on the negative offset F (dBc) 64.Absolute peak power on the negative offset F (dBm) 65.Peak frequency in the negative offset F (Hz) 66.Relative power on the positive offset F (dBc) 67.Absolute power on the positive offset F (dBm) 68.Relative peak power on the positive offset F (dBc) 69.Absolute peak power on the positive offset F (dBm) 70.Peak frequency in the positive offset F (Hz)
Using Power Spectral Density Reference	(Continued) n=1 (or not specified)	Returns 60 comma-separated scalar results, in the following order (70 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Absolute power at the center frequency (reference) area (dBm) 3. Reserved for the future use, returns –999.0 4. Reserved for the future use, returns –999.0 5. Peak frequency in the center frequency (reference) area (Hz) 6. Reserved for the future use, returns –999.0 7. Reserved for the future use, returns –999.0 8. Reserved for the future use, returns –999.0 9. Reserved for the future use, returns –999.0 10.Reserved for the future use, returns –999.0 11.Relative power on the negative offset A (dB). For WLAN Radio Std., returns –999.0. 12.Absolute power on the negative offset A (dBm/Hz). For WLAN Radio Std., returns –999.0. 13.Relative peak power on the negative offset A (dB) 14.Absolute peak power on the negative offset A (dBm/Hz) 15.Peak frequency in the negative offset A (Hz) 16.Relative power on the positive offset A (dB). For WLAN Radio Std., returns –999.0.

Measurement Results Available (continued)

Command / Condition	n	Results Returned
Using Power Spectral Density Reference	(Continued) n=1 (or not specified)	17.Absolute power on the positive offset A (dBm/Hz). For WLAN Radio Std., returns –999.0. 18.Relative peak power on the positive offset A (dB) 19.Absolute peak power on the positive offset A (dBm/Hz) 20.Peak frequency in the positive offset A (Hz) 21.Relative power on the negative offset B (dB). For WLAN Radio Std., returns –999.0. ... 59.Absolute peak power on the positive offset E (dBm/Hz)
		60.Peak frequency in the positive offset E (Hz) If offset F is active: 61.Relative power on the negative offset F (dB). For WLAN Radio Std., returns –999.0. 62.Absolute power on the negative offset F (dBm/Hz). For WLAN Radio Std., returns –999.0. 63.Relative peak power on the negative offset F (dB) 64.Absolute peak power on the negative offset F (dBm/Hz) 65.Peak frequency in the negative offset F (Hz) 66.Relative power on the positive offset F (dB). For WLAN Radio Std., returns –999.0. 67.Absolute power on the positive offset F (dBm/Hz). For WLAN Radio Std., returns –999.0. 68.Relative peak power on the positive offset F (dB) 69.Absolute peak power on the positive offset F (dBm/Hz) 70.Peak frequency in the positive offset F (Hz)
	n=2	Returns the displayed frequency domain spectrum trace data separated by comma. The number of data points is determined by the setting of the trace points parameter.
	n=3	Returns the displayed frequency domain absolute limit trace data separated by comma. The number of data points is determined by the setting of the trace points parameter.
	n=4	Returns the displayed frequency domain relative limit trace data separated by comma. The number of data points is determined by the setting of the trace points parameter.

Measurement Results Available (continued)		
Command / Condition	**n**	**Results Returned**
Using Total Power Reference	n=5	**Total Power Reference** Returns 12 comma-separated scalar values (in dBm) of the absolute power of the segment frequencies (14 when offset F is active): 1. Total power reference (dBm) 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)
Using Power Spectral Density Reference	n=5	**Power Spectral Density Reference** Returns 12 comma-separated scalar values (in dBm/Hz) of the absolute power of the segment frequencies (14 when the offset F is active): 1. Total power reference (dBm) 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11. Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)
Using Total Power Reference	n=6	**Total Power Reference** Returns 12 comma-separated scalar values (in dBc) of the power relative to the carrier at the segment frequencies (14 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)

Measurement Results Available (continued)

Command / Condition	n	Results Returned
Using Power Spectral Density Reference	n=6	Power Spectral Density Reference Returns 12 comma-separated scalar values (in dBc/Hz) of the power relative to the carrier at the segment frequencies (14 when offset F is active). Returns –999.0 for the offsets in WLAN standard: 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)
	n=7	Returns 12 comma-separated pass/fail test results (0 = passed, or 1 = failed) determined by testing the absolute power in each offset against the specified offset's absolute power limits (14 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)
	n=8	Returns 12 comma-separated scalar values of the pass/fail (0 = passed, or 1 = failed) results determined by testing the relative power in each offset against the specified offset's relative power limits (14 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)

Measurement Results Available (continued)		
Command / Condition	**n**	**Results Returned**
	n=9	Returns 12 comma-separated scalar values of frequency (in Hz) that have peak power in each offset (14 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)
	n=10	Returns 12 comma-separated scalar values (in dBm) of the absolute peak power of the segment frequencies (14 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)
	n=11	Returns 12 comma-separated scalar values (in dBc) of the peak power relative to the carrier at the segment frequencies (14 when offset F is active): 1. Reserved for the future use, returns –999.0 2. Reserved for the future use, returns –999.0 3. Negative offset frequency (A) 4. Positive offset frequency (A) ... 11.Negative offset frequency (E) 12.Positive offset frequency (E) If offset F is active: 13.Negative offset frequency (F) 14.Positive offset frequency (F)
	n=12	Returns the band power result when in WLAN standard. If not in WLAN standard the value returned will be –999.0
	n=13	Returns the number of failed trace points

Measurement Results Available (continued)		
Command / Condition	**n**	**Results Returned**
	n=14	Returns the frequency and amplitude delta from the limit of each failed point

Example:

```
FETC:SEM? or MEAS:SEM? or READ:SEM?
```

15 Measurement Setup

Displays the setup menu for the currently selected measurement. This menu is empty if no measurement is active. This could be because Meas Off is selected in the Measure menu.

Key Path: Front-panel key

Dependencies/Couplings: Menu choices depend on the currently selected Mode and Menu

Remote Command:

There is no equivalent remote command.

Meas Setup (Channel Power—CHP)

When the channel power measurement has been selected in the Measure key menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

The Channel Power measurement measures the power and power spectral density in the channel bandwidth that you specify. One marker pair on the display indicates the edges of the channel bandwidth. The center frequency, reference level, and channel bandwidth must be set by the user.

Key Path: Front-panel key

Dependencies/Couplings: Menu changes depending on the Mode and Measurement selected.

State Saved: No save

Remote Command:

There is no equivalent remote command.

Avg Number

Specifies the number of measurement averages used when calculating the measurement result set Avg Number to On. The average will be displayed at the end of each sweep. Setting Avg Number to Off disables measurement averaging.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 averages/ Off

Range: 1 to 1000

Remote Command:

```
[:SENSe]:CHPower:AVERage:COUNt <integer>
[:SENSe]:CHPower:AVERage:COUNt?
[:SENSe]:CHPower:AVERage[:STATe] OFF|ON|0|1
[:SENSe]:CHPower:AVERage[:STATe]?
```

Example:

```
CHP:AVER:COUN 10
CHP:AVER:COUN?
CHP:AVER OFF
CHP:AVER?
```

Avg Mode

Selects the type of termination control used for the averaging function to either Exp or Repeat. This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode) When you set Avg Mode to Exp, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

Repeat When you set Avg Mode to Repeat, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: EXPonential

Remote Command:

```
[:SENSe]:CHPower:AVERage:TCONrol EXPonential|REPeat
```

```
[:SENSe]:CHPower:AVERage:TCONrol?
```

Example:

```
CHP:AVER:TCON EXP
```

```
CHP:AVER:TCON?
```

Integ BW

Specifies the range of integration used in calculating the power in the channel. Note that the integration bandwidth is displayed on the trace as two markers connected by an arrow. Be sure the Span of the instrument is set between 1 and 10 times the integration bandwidth.

Key Path: Meas Setup

Key Notes: If RRC Filter is on, the actual integration bandwidth used is the displayed integration bandwidth multiplied by (1 + "Filter Alpha").

State Saved: Saved in Instrument State.

Factory Preset: 2 MHz, or as defined by the selected radio standard.

Terminators: GHz, MHz, kHz, Hz

Default Terminator: Hz

Range: 100 Hz to maximum span.

Remote Command:

```
[:SENSe]:CHPower:BANDwidth|BWIDth:INTegration <freq>
[:SENSe]:CHPower:BANDwidth|BWIDth:INTegration?
```

Example:

```
CHP:BAND:INT 1 MHz
CHP:BAND:INT?
```

Chan Pwr Span

Sets the N8201A span for the channel power measurement. When the RRC Filter is set to On, the lower limit for the span is (1 + alpha) × Integration BW .

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 3 MHz, or as defined by the selected radio standard.

Default Terminator: Hz

Range: Current integration bandwidth to 10 times the integration bandwidth or span of your N8201A.

Remote Command:

```
[:SENSe]:CHPower:FREQuency:SPAN <freq>
```

```
[:SENSe]:CHPower:FREQuency:SPAN?
```

Example:

```
CHP:FREQ:SPAN 2 MHz
```

```
CHP:FREQ:SPAN?
```

Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

There will always be a minimum of 2 dB of attenuation set to protect the N8201A input.

Key Path: Meas Setup

State Saved: Not saved.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

RRC Filter

Turns the Root Raised Cosine filter on or off. This filter is the type specified in the TETRA and 3GPP W-CDMA standards. This parameter is only available when either 3GPP W-CDMA or TETRA has been selected as the Radio Std from the Mode Setup menu. If 3GPP W-CDMA is selected, the rolloff value (alpha) for the filter will be initially set to 0.22. T is set to 1/RefBW (default 260 ns). If TETRA is selected, the rolloff will be initially set to 0.35. T is set to 1/RefBW (default 55.56 ms). The rolloff value can be changed using Filter Alpha.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:CHPower:FILTer[:RRC][:STATe] OFF|ON|0|1
```

```
[:SENSe]:CHPower:FILTer[:RRC][:STATe]?
```

Example:

```
CHP:FILT 1
```

```
CHP:FILT?
```

Filter Alpha

Inputs the alpha value for the RRC Filter. This parameter is only available when either 3GPP W-CDMA or TETRA has been selected as the Radio Std. from the Mode Setup menu.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 0.22 when W-CDMA is selected, 0.35 for TETRA, otherwise Off.

Range: 0.01 to 1.0

Remote Command:

```
[:SENSe]:CHPower:FILTer[:RRC]:ALPHA <number>
[:SENSe]:CHPower:FILTer[:RRC]:ALPHA?
```

Example:

```
CHP:FILT:ALPH 0.22
CHP:FILT:ALPH?
```

Meas Setup (Occupied Bandwidth—OBW)

When Occupied BW has been selected in the Measure menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

The Occupied Bandwidth measurement integrates the power of the displayed spectrum and puts markers at the frequencies between which a selected percentage of the power is contained. The measurement defaults to 99% of the occupied bandwidth power. The power-bandwidth routine first computes the combined power of all signal responses contained in the trace. For 99% occupied power bandwidth, markers are placed at the frequencies on either side of 99% of the power. 1% of the power is evenly distributed outside the markers. The difference between the marker frequencies is the 99% power bandwidth and is the value displayed.

The occupied bandwidth function also indicates the difference between the N8201A center frequency and the center frequency of the channel, referred to as “Transmit Freq Error.” The measurement can be made in single or continuous sweep mode. The center frequency, reference level, and channel spacing must be set by the user.

Key Path: Front-panel key

Avg Number

Specifies the number of measurement averages used when calculating the measurement result. The average is displayed at the end of each sweep. Press Avg Number (Off) to disable measurement averaging.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 averages / Off

Range: 1 through 1000

Remote Command:

```
[:SENSe]:OBWidth:AVERage:COUNt <integer>
[:SENSe]:OBWidth:AVERage:COUNt?
[:SENSe]:OBWidth:AVERage[:STATe] OFF|ON|0|1
[:SENSe]:OBWidth:AVERage[:STATe]?
```

Example:

```
OBW:AVER:COUN 20
OBW:AVER:COUN?
OBW:AVER ON
OBW:AVER?
```

Avg Mode

Enables you to select the type of termination control used for the averaging function (Exp or Repeat). This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode) Each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average is displayed at the end of each sweep.

Repeat After reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: EXPonential

Remote Command:

```
[:SENSe]:OBW:AVERage:TCONtrol EXPonential|REPeat
[:SENSe]:OBW:AVERage:TCONtrol?
```

Example:

```
OBW:AVER:TCON EXP
OBW:AVER:TCON?
```

Max Hold

Enables you to turn maximum hold trace feature On or Off for the measurement. Maximum hold displays and holds the maximum responses of a signal.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:OBW:MAXHold OFF|ON|0|1
```

```
[:SENSe]:OBW:MAXHold?
```

Example:

```
OBW:MAXH ON
```

```
OBW:MAXH?
```

Occ BW % Pwr

Enables you to change the percentage of signal power used when determining the occupied bandwidth.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 99.0%

Range: 10.0% through 99.99%

Remote Command:

```
[:SENSe]:OBWidth:PERCent <percent>
[:SENSe]:OBWidth:PERCent?
```

Example:

```
OBW:PERC 98
OBW:PERC?
```

OBW Span

Enables you to specify the range of integration used in calculating the total power from which the percent occupied bandwidth is then calculated. The N8201A span will be set to the same value as the OBW Span for the measurement. OBW Span should be set to approximately 2 times the expected occupied bandwidth result.

If you have an adjacent channel, you should not set the OBW span to 2X your occupied bandwidth. The OBW measurement first computes all the power in the span and then 99% of that. Diamond markers are set around the bandwidth, and the occupied bandwidth results is displayed in the data window. If the power of the adjacent channel is included in the calculation for the 100% power, the OBW result will be too high. The OBW Span should be set narrow enough to encompass the channel of interest and exclude any unwanted adjacent channels.

Key Path: Meas Setup

Factory Preset: 3 MHz, or as defined by the radio standard selected.

Default Terminator: Hz

Remote Command:

```
[:SENSe]:OBW:FREQuency:SPAN <freq>
```

```
[:SENSe]:OBW:FREQuency:SPAN?
```

Example:

```
OBW:FREQ:SPAN 10 MHz
```

```
OBW:FREQ:SPAN?
```

x dB

Enables you to specify the power level used to determine the emission bandwidth as the number of dB down from the highest signal point (P1), within the occupied bandwidth span. This function is an independent calculation from the OBW calculation. The x dB bandwidth result is also called the emissions bandwidth, or EBW. This will set arrow markers (f1 and f2) to your specified dB value below the maximum power and compute the total power between those arrows. Frequencies f1 and f2 are determined as the furthest frequencies x dB below and above P1, respectively. The emission bandwidth is then calculated as f2 - f1 as shown by the arrows indicated in Figure 8 (note that the diamond markers are for the OBW function).

NOTE The asterisk next to the x dB bandwidth value in Figure 8 indicates the results may not have been determined with optimal N8201A settings. If emission bandwidth is your primary interest, select Meas Setup, Max Hold. Then change detector mode to peak by pressing Det/Demod, Detector, Peak. Acquiring peak data ensures accuracy of this measurement.

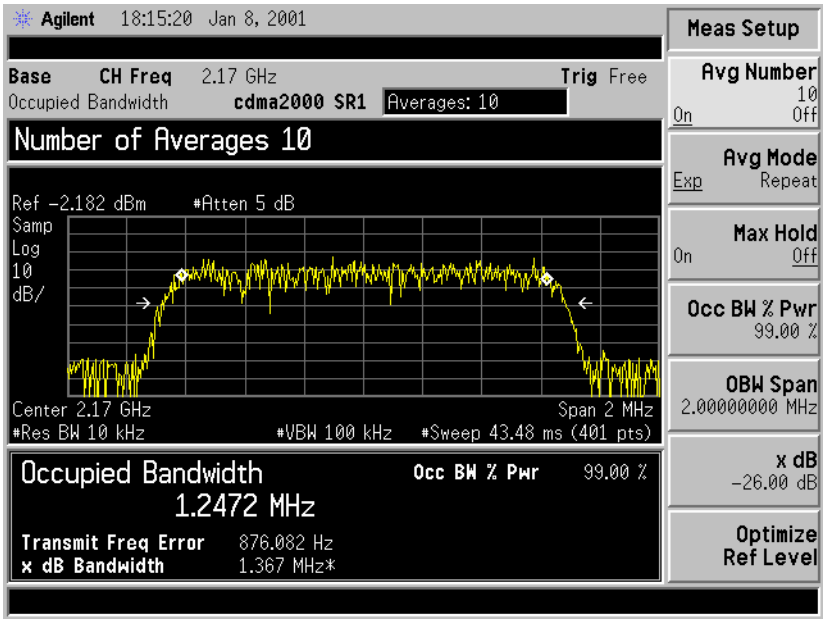


Figure 8 Occupied Bandwidth Measurement Results

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: –26 dB

Default Terminator: dB

Range: –100.0 dB through –0.1 dB

Remote Command:

```
[:SENSe]:OBW:XDB <dB value>
```

```
[:SENSe]:OBW:XDB?
```

Example:

```
OBW:XDB -50dB
```

```
OBW:XDB?
```

Optimize Ref Level

Sets the input attenuator to optimize the robustness of the measurement, which is its freedom from errors due to input compression.

There will always be a minimum of 2 dB of attenuation set to protect the N8201A input.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

Meas Setup (Adjacent Channel Power—ACP)

If the adjacent channel power (ACP) measurement has been selected in the Measure menu of the spectrum analysis mode, this key displays the ACP measurement setup menu.

The adjacent channel power measurement measures the power that leaks into adjacent transmit channels. Depending on the radio standard chosen from the Mode Setup menu, this measurement can run in several different modes in order to measure different types of signals.

Key Path: Front-panel key

Remote Command:

There is no equivalent remote command.

Avg Number

Specifies the number of measurements that will be averaged when calculating the measurement result. The average will be displayed at the end of each sweep.Setting Avg Number to Off disables the measurement averaging.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 / Off

Range: 1 to 1000

Remote Command:

```
[:SENSe]:ACPower:AVERage:COUNt <integer>

[:SENSe]:ACPower:AVERage:COUNt?

[:SENSe]:ACPower:AVERage[:STATe] OFF|ON|0|1 turns the
averaging on or off.

[:SENSe]:ACPower:AVERage[:STATe]?
```

Example:

```
ACP:AVER:COUN 10

ACP:AVER:COUN?

ACP:AVER OFF

ACP:AVER?
```

Avg Mode

Selects the type of termination control used for the averaging function as either Exp or Repeat. This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode) When you set Avg Mode to Exp, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

Repeat When you set Avg Mode to Repeat, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: EXPonential

Remote Command:

```
[:SENSe]:ACPower:AVERage:TCONrol EXPonential|REPeat
[:SENSe]:ACPower:AVERage:TCONrol?
```

Example:

```
ACP:AVER:TCON EXP
ACP:AVER:TCON?
```

Chan Integ BW

Specifies the range of integration used in calculating the power in the main channel.

Key Path: Meas Setup

Key Notes: If RRC Filter is on, the actual integration bandwidth used is the displayed integration bandwidth multiplied by (1 + Filter Alpha).

State Saved: Saved in Instrument State.

Factory Preset: 2.0 MHz or as defined by the selected radio standard.

Default Terminator: Hz

Range: 300 Hz to 500 MHz. Depends on the adjacent-channel settings and the minimum and maximum N8201A span.

Remote Command:

```
[:SENSe]:ACPower:BANDwidth|BWIDth:INTegration <freq>
```

```
[:SENSe]:ACPower:BANDwidth|BWIDth:INTegration?
```

Example:

```
ACP:BWID:INT 5E6
```

```
ACP:BWID:INT?
```

Offset/Limits

Accesses menu keys that allow you to configure the offsets for the ACP measurement.

Key Path: Meas Setup

Offset A, B, C, D, E, or F

Accesses a menu of keys to setup an offset.

Key Path: Meas Setup, Offset Setup

State Saved: Saved in Instrument State.

Factory Preset: A

Remote Command: There is no remote command for this function.

Offset Freq

Enables you to set the frequency difference from the center of the main channel to the center of the offset for a maximum of 6 offsets (labeled A-F). It also allows you to turn on/off the offsets that you want to measure.

This key label changes to Edge Freq when IS-95C, cdma2000 MC-1X, cdma2000 MC-3X, and cdma2000 DS is selected.

Key Path: Meas Setup, Offset Setup

State Saved: Saved in Instrument State.

Factory Preset: The following table shows the default array if no radio standard (None) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz
B	OFF	0 Hz	2 MHz
C	OFF	0 Hz	2 MHz
D	OFF	0 Hz	2 MHz
E	OFF	0 Hz	2 MHz
F	OFF	0 Hz	2 MHz

Default Terminator: Hz

Range: 0 Hz to 500 MHz

Remote Command:

```
[:SENSe]:ACPower:OFFSet:LIST[:FREQuency]
<f_offset>,<f_offset>,<f_offset>,<f_offset>,<f_offset>,
<f_offset>
[:SENSe]:ACPower:OFFSet:LIST[:FREQuency]?
[:SENSe]:ACPower:OFFSet:LIST:STATE
OFF|ON|0|1, OFF|ON|0|1, OFF|ON|0|1, OFF|ON|0|1, OFF|ON|0|1,
OFF|ON|0|1
[:SENSe]:ACPower:OFFSet:LIST:STATE?
```

Remote Command Notes: This command, along with commands `[:SENSe]:ACPower:OFFSet:LIST:BANDwidth|BWIDth [:INTegration]` and `[:SENSe]:ACPower:OFFSet:LIST:STATe`, are used to set the parameters for all of the offsets, up to six. The following table shows the values of these parameters if no radio standard (None) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz
B	OFF	0	2 MHz
C	OFF	0	2 MHz
D	OFF	0	2 MHz
E	OFF	0	2 MHz
F	OFF	0	2 MHz

Example:

Sending fewer than six parameters to one of these commands will leave the values of the unspecified offsets unchanged. If you don't send settings for all 6 offsets, it will set all the offsets that you specified, then it will set any remaining offsets to the same setting as the last offset that you sent.

```
ACP:OFFS:LIST 50 Hz,75 Hz,100 Hz,125 Hz,150 Hz,175 Hz
ACP:OFFS:LIST:STAT ON,ON,ON,OFF,OFF,OFF
```

For example, after the above command is sent, sending the command with only four paramenters (`ACP:OFFS:LIST:STAT ON,ON,ON,OFF`) will result in the fifth and sixth offset remaining the same as the previous setting (OFF).

Ref BW

Sets the reference bandwidth (integration bandwidth) for each offset.

Key Path: Meas Setup, Offset Setup

State Saved: Saved in Instrument State.

Factory Preset: 2 MHz, if no radio standard (None) is selected.

If a radio standard is selected, the default value is defined by the selected standard. This command, along with commands `[:SENSe]:ACPower:OFFSet:LIST[:FREQuency]` and `[:SENSe]:ACPower:OFFSet:LIST:STATe` are used to set an entire array of values. The following table shows the default array if no radio standard (None) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz
B	OFF	0 Hz	2 MHz
C	OFF	0 Hz	2 MHz
D	OFF	0 Hz	2 MHz
E	OFF	0 Hz	2 MHz
F	OFF	0 Hz	2 MHz

Default Terminator: Hz

Range: 300 Hz to 500 MHz

Remote Command:

```
[:SENSe]:ACPower:OFFSet:LIST:BANDwidth|BWIDth
[:INTegration] <bw>,<bw>,<bw>,<bw>,<bw>,<bw>
```

```
[:SENSe]:ACPower:OFFSet:LIST:BANDwidth|BWIDth
[:INTegration]?
```

Remote Command Notes: If a radio standard is selected, the default value is defined by the selected standard. This command, along with commands `[:SENSe]:ACPower:OFFSet:LIST[:FREQuency]` and `[:SENSe]:ACPower:OFFSet:LIST:STATe` are used to set an entire array of values. The following table shows the default array if no radio standard (None) is selected.

Offset	State	Frequency	Integ. BW
A	ON	3 MHz	2 MHz

Offset	State	Frequency	Integ. BW
B	OFF	0 Hz	2 MHz
C	OFF	0 Hz	2 MHz
D	OFF	0 Hz	2 MHz
E	OFF	0 Hz	2 MHz
F	OFF	0 Hz	2 MHz

Example:

```
ACP:OFFS:LIST:BAND 50,50,50,50,50,50

ACP:OFFS:LIST:BAND?
```

Pos Offset Limit

Enables you to set the upper limit for the upper segment of the specified offset pair.

Key Path: Meas Setup, Offset Setup

State Saved: Saved in Instrument State.

Factory Preset: 0.00 dB

Default Terminator: dB

Range: –200 dB to 200 dB

Remote Command:

```
:CALCulate:ACPower:OFFSet:LIST:LIMit:POSitive[:UPPer]:DATA
<rel_power>,<rel_power>,<rel_power>,<rel_power>,
<rel_power>,<rel_power>

:CALCulate:ACPower:OFFSet:LIST:LIMit:POSitive[:UPPer]
:DATA?
```

Example:

```
CALC:ACP:OFFS:LIST:LIM:POS:DATA 10,10,10,10,10,10

CALC:ACP:OFFS:LIST:LIM:POS:DATA?
```

Neg Offset Limit

Enables you to set the upper limit for the lower segment of the specified offset pair.

Key Path: Meas Setup, Offset Setup

State Saved: Saved in Instrument State.

Factory Preset: 0.00 dB

Default Terminator: dB

Range: –200 dB to 200 dB

Remote Command:

```
:CALCulate:ACPower:OFFSet:LIST:LIMit:NEGative[:UPPer]:DATA
<rel_power>,<rel_power>,<rel_power>,<rel_power>,
<rel_power>,<rel_power>
```

```
:CALCulate:ACPower:OFFSet:LIST:LIMit:NEGative[:UPPer]
:DATA?
```

Example:

```
CALC:ACP:OFFS:LIST:LIM:NEG:DATA -50,-50,-50,-50,-50,-50
```

```
CALC:ACP:OFFS:LIST:LIM:NEG:DATA?
```

Meas Type

Specifies the reference for the measurement, either Total Pwr Ref or PSD Ref. Relative values can be displayed referenced to either the total power (Total Pwr Ref) or the power spectral density (PSD Ref) measured in the main channel.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Total Pwr Ref

Remote Command:

```
[:SENSe]:ACPower:TYPE PSDRef|TPRef
```

```
[:SENSe]:ACPower:TYPE?
```

Example:

```
ACP:TYPE PSDR
```

```
ACP:TYPE?
```

Total Pwr Ref

When Total Pwr Ref is selected, the power in the carrier is used as the reference in computing the relative power values for the offsets.

Key Path: Meas Setup, Meas Type

PSD Ref

When PSD Ref is selected, the mean power spectral density of the carrier is used in computing the relative power spectral density values for the offsets.

Key Path: Meas Setup, Meas Type

Factory Preset: On (Auto)

Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, in which it is free from errors due to input compression and log amp range limitations. The input attenuator setting will not necessarily give the optimum dynamic range, nor the optimum accuracy. No single setting can optimize both, and the optimum setting often depends on the signal characteristics.

There will always be a minimum of 2 dB of attenuation set to protect the N8201A input.

Key Path: Meas Setup

State Saved: Not saved.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

Method

Enables you to set the measurement method. The resolution bandwidth method is most useful for measuring cdmaOne and cdma2000 signals; the integration bandwidth method is preferred for other signals.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: IBW

Remote Command:

```
[:SENSe]:ACPower:METHod IBW|RBW|FAST
[:SENSe]:ACPower:METHod?
```

Example:

```
ACP:METH RBW
ACP:METH?
```

IBW

Sets the measurement control method to IBW.

Key Path: Meas Setup, Method

Remote Command: Use `[:SENSe]:ACPower:METHod`. See “Method” on page 91.

Example: `ACP:METH IBW`

RBW

Sets the measurement control method to RBW.

Key Path: Meas Setup, Method

Remote Command: Use `[:SENSe]:ACPower:METHod`. See “Method” on page 91.

Example: `ACP:METH RBW`

Fast

Sets the measurement control method to Fast. When Fast method is selected, the 5 point ACLR measurement method is used. The following parameters are configured to allow the measurement to be made. This method is only available for the 3GPP W-CDMA radio standard, this key will be disabled for all other radio standards.

The current function values are not saved when fast method is turned on. Most functions are disabled when Fast is selected.

Function	Value
Channel Integration BW	3.84 MHz
Offset State	On, On, Off, Off, Off, Off
Offset Frequency	5 MHz, 10 MHz, 0 Hz, 0Hz, 0 Hz
Ref BW	3.84 MHz
Meas Type	Total Pwr Ref
Opt Ref Lvl	Disabled
RRC Filter State	On
Filter Alpha	0.22 (T fixed at 1/3.84 MHz)
Noise Correction	Off
Radio Std *	3 GPP W-CDMA
Sweep Time *, †	6.2 ms
Sweep Time Mode *	Manual
Gate	Off
Sweep Points *	5
Trigger	Free Run
Detector	Average
Res BW	470 kHz
Res BW Mode	Manual
Video BW	5 MHz
Video BW Mode	Auto
Avg/VBW Type	Power
Avg/VBW Type Mode	Auto
Span	23.84 MHz
Span Zoom	Not Applicable

Function	Value
Full Span	Not Applicable
Zero Span	Not Applicable
Last Span	Not Applicable
Signal Track	Not Applicable

* This function is not disabled when Fast is selected.

† The maximum sweep time available is limited to 27 ms.

Key Path: Meas Setup, Method

Remote Command:

Use `[:SENSe]:ACPower:METHod`. "Method" on page 298.

Example: `ACP:METH FAST`

The following is an example of how to optimize speed.

```
FORM:DATA REAL,32
CAL:AUTO OFF
CONF:ACP
RAD:STAN W3GPP
SWE:POIN 601
ACP:AVER OFF
ACP:CARR:AUTO ON
ACP:FILT ON
ACP:FILT:ALPH 0.22
ACP:CORR:NOISE OFF
POW:RANG:AUTO ONCE
ACP:METH FAST
INIT:CONT OFF
DISP:ENAB OFF
INIT:ACP
```

Total Pwr Ref

Enables you to set the adjacent channel power reference to automatic or manual when Meas Type is set to Total Pwr Ref. When set to automatic, the carrier power result reflects the measured power value in the carrier. When set to manual, the last measured value is captured and held, or may be entered by the user. Relative values are displayed, referenced to the total power measured in the main channel.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Auto, Measured carrier power value

Terminators: dBm

Default Terminator: dBm

Range: –200 dBm to 200 dBm

Remote Command:

```
[:SENSe]:ACPower:CARRier[:POWer]
[:SENSe]:ACPower:CARRier:AUTO[:STATe] OFF|ON|0|1
[:SENSe]:ACPower:CARRier:AUTO[:STATe]?
```

Example:

```
ACP:CARR:AUTO 0
ACP:CARR:AUTO?
```

PSD Ref

This function is only available when measurement type is set to PSD Ref.

Enables you to set the power spectral density in the carrier (main channel) that will be used to compute the relative power spectral density values for the offsets when Meas Type is set to PSD Ref. When the PSD Ref state is set to Auto, this will be set to the measured carrier power spectral density.

Factory Preset: 0 dBm

Terminators: dBm

Default Terminator: dBm

Remote Command:

```
[:SENSe]:ACPower:CARRier:CPSD <dBm>
```

```
[:SENSe]:ACPower:CARRier:CPSD?
```

Remote Command Notes:

This function is only available when measurement type is set to PSD Ref, use the command `[:SENSe]:ACPower:TYPE PSDRef` to select the measurement type.

Example:

```
ACP:CARR:CPSD 5
```

Limit Test

Turns the testing of the limit line on or off. When Limit Test is set to On, each offset is compared to its upper and lower offset limit. In those cases where the power exceeds the limit, a red “F” is placed next to the dBc result to indicate a failure. If there are any failures, the pass/fail indicator area show “FAIL” in red; if there are none, it shows “PASS” in green. Any offsets that are in the off state (see“Offset Freq" on page 291) are not measured and their results will not be displayed on screen.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:ACPower:LIMit[:STATe] OFF|ON|0|1
```

```
[:SENSe]:ACPower:LIMit[:STATe]?
```

Example:

```
ACP:LIM 1
```

```
ACP:LIM?
```

RRC Filter

Turns the Root Raised Cosine filter on or off. This filter is the type specified in the NADC and 3GPP W-CDMA standards and is only available when 3GPP W-CDMA, NADC, or Tetra is selected as the Radio Std from the Mode Setup menu. If 3GPP W-CDMA is selected, the rolloff value (alpha) for the filter will be initially set to 0.22. T is set to 1/RefBW (default 260 ns). If NADC is selected, the rolloff will be initially set to 0.35. T is set to 1/RefBW (default 42 ms). If TETRA has been selected, the rolloff will be initially set to 0.35. T is set to 1/RefBW (default 55.6 ms). The rolloff value can be changed using Filter Alpha.

The filter is unavailable when the measurement method is set to RBW.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:ACPower:FILTer[:RRC][:STATe] OFF|ON|0|1
```

```
[:SENSe]:ACPower:FILTer[:RRC][:STATe]?
```

Example:

```
ACP:FILT 1
```

```
ACP:FILT?
```

Filter Alpha

Inputs the alpha value for the RRC Filter. This parameter is available when 3GPP W-CDMA, NADC, or TETRA has been selected as the Radio Std. from the Mode Setup menu.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 0.22 when W-CDMA is selected, 0.35 when NADC or TETRA is selected, otherwise Off.

Range: 0.01 to 1.0

Remote Command:

```
[:SENSe]:ACPower:FILTer[:RRC]:ALPHA <number>
```

```
[:SENSe]:ACPower:FILTer[:RRC]:ALPHA?
```

Example:

```
ACP:FILT:ALPH 0.22
```

```
ACP:FILT:ALPH?
```

Noise Correction

Turns noise correction on or off. When you set Noise Corr to On, a calibration of the noise floor is performed and used to correct for N8201A noise floor contribution to measurement levels, increasing dynamic range.

Noise Correction is unavailable if signal tracking is on, or when the radio standard is set to NADC or PDC when the measurement method is set to RBW.

Key Path: Meas Setup,

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:ACPower:CORRection:NOISe[:AUTO] OFF|ON|0|1
```

```
[:SENSe]:ACPower:CORRection:NOISe[:AUTO]?
```

Remote Command Notes:

The noise correction feature is not available when the radio standard is set to NADC or PDC

Example:

```
ACP:CORR:NOIS 1
```

```
ACP:CORR:NOIS?
```

Meas Setup (Multi-Carrier Power—MCP)

If the MCP measurement has been selected in the Measure menu of the Spectrum Analysis mode, this key displays the MCP measurement setup menu.

The Multi-Carrier Power measurement is a measure of the power in two or more transmit channels and of the power that leaks into their adjacent transmit channels. The results reported are similar to the adjacent channel power measurement, but the setup is different to allow for two or more carriers present.

Key Path: Front-panel key

Dependencies/Couplings:

Parameter defaults change depending on the Radio Standard selected.

Sweep time is coupled to span, RBW, and VBW if the measurement method is set to IBW.

Remote Command:

There is no equivalent remote command.

Avg Number

Enables you to specify the number of measurements that will be averaged when calculating the measurement result. The average will be displayed at the end of each sweep. Setting Avg Number to Off disables the measurement averaging.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 / Off

Range: 1 through 1000

Remote Commands:

```
[:SENSe]:MCPower:AVERage:COUNt <integer>
[:SENSe]:MCPower:AVERage:COUNt?
[:SENSe]:MCPower:AVERage[:STATe] OFF|ON|0|1
[:SENSe]:MCPower:AVERage[:STATe]?
```

Example:

```
MCP:AVER:COUN 10
MCP:AVER:COUN?
MCP:AVER OFF
MCP:AVER?
```

Avg Mode

Selects the type of termination control used for the averaging function as either Exp or Repeat. This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode) When you set Avg Mode to Exp, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

Repeat When you set Avg Mode to Repeat, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Exponential

Remote Command:

```
[:SENSe]:MCPower:AVERage:TCONrol EXPonential|REPeat
[:SENSe]:MCPower:AVERage:TCONrol?
```

Example:

```
MCP:AVER:TCON EXP
MCP:AVER:TCON?
```

Carrier Setup

Accesses the Carrier Setup and Configure Carriers menus that allow you to define the various parameters for each carrier.

Key Path: Meas Setup

Remote Command:

There is no equivalent remote command.

Carriers

Specifies the number of carriers to be measured.

Key Path: Meas Setup, Carrier Setup

Factory Preset: 4

Range: 2 to 12

Remote Command:

```
[:SENSe]:MCPower:CARRier:COUNt<integer>
[:SENSe]:MCPower:CARRier:COUNt?
```

Example:

```
MCP:CARR:COUN 10
MCP:CARR:COUN?
```

Ref Carrier

Specifies the carrier (identified by a numeric position) from which all relative power measurements will be made. When Ref Carrier is set to Auto, the N8201A selects the carrier with the highest power as the reference.

Key Path: Meas Setup, Carrier Setup

Key Notes: The carrier must have power present in order to be assigned as a reference carrier frequency. If you change the reference carrier's power present value from "yes" to "no", the next carrier to the left (or to the right, if there are none to the left) will be assigned as the reference carrier. If it currently has power present set to No, this will change to Yes. This is also true when there are only two carriers with a "yes" value. Refer to the "Carrier Pwr Present" key description for more information on setting the carrier power present value.

Factory Preset: Auto

Range:

Auto/Man

1 to 12

Remote Command:

```
[:SENSe]:MCPower:RCARrier:AUTO OFF|ON|0|1

[:SENSe]:MCPower:RCARrier:AUTO?

[:SENSe]:MCPower:RCARrier<integer>

[:SENSe]:MCPower:RCARrier?
```

Example:

```
MCP:RCAR:AUTO ON

MCP:RCAR 3

MCP:RCAR?
```

Ref Carrier Freq

Determines whether the Ref Carrier Freq is calculated based on the Center frequency (Auto) or the Center frequency is calculated based on the Ref Carrier Freq (Man). The Ref Carrier Freq value will always be updated if the Ref Carrier Freq setting is changed, whether the Mode is set to Auto or Manual.

If Ref Carrier Freq is set to auto, it is assumed that the carriers are distributed evenly around the current center frequency. In this case the following three steps are used to calculate the Ref Carrier Freq value and the calculated Ref Carrier Freq is shown on the Ref Carrier Freq key:

1 Ref Freq 1 = Cntr Freq - [(Total of all Carrier Widths)/2]

2 Ref Freq 2 = Ref Freq 1+ (Total of all Carrier Widths excluding the Ref Carrier Width)

3 Ref Freq = Ref Freq 2 + [0.5 (Carrier Width of Ref Carrier)]

The Ref Carrier Freq can also be entered by the user. This will set the Ref Carrier Freq to Man and the Center frequency of the N8201A will be calculated using the following three steps:

1 Cntr Freq 1 = Ref Freq - [0.5 (Carrier Width of Ref Carrier)]

2 Cntr Freq 2 = Cntr Freq 1 - (Total of all Carrier Widths excluding the Ref Carrier Width)

3 Cntr Freq = Cntr Freq 2 + [(Total of all Carrier Widths)/2]

The above algorithms ensure that the carrier is centered on the display.

Key Path: Meas Setup, Carrier Setup

Dependencies/Couplings: The reference carrier can be re-assigned by implementing changes to carrier power present values.

State Saved: Saved in Instrument State.

Factory Preset: Auto/Calculated based on current center frequency. Refer to the algorithm above when defining the Ref Carrier Freq(Auto) key.

Terminators: Hz, kHz, MHz, GHz

Default Terminator GHz

Resolution: 1 Hz

Range: N8201A minimum to N8201A

Remote Command:

```
[:SENSe]:MCPower:RCFRequency <Freq>
[:SENSe]:MCPower:RCFRequency?
[:SENSe]:MCPower:RCFRequency:AUTO OFF|ON|0|1
[:SENSe]:MCPower:RCFRequency:AUTO?
```

Example:

```
MCP:RCFR 2 GHz
MCP:RCFR?
```

Configure Carriers

Accesses the Config Carriers menu that allows further definition of each carrier.

Key Path: Meas Setup, Carrier Setup

Remote Command: There is no equivalent remote command.

Carrier

Selects the carrier number you wish to configure.

Key Path: Meas Setup, Carrier Setup, Configure Carriers

Dependencies/Couplings: All keys available on the Configure Carrier key menu are coupled to this key.

State Saved: Saved in Instrument State.

Factory Preset: 1

Range: 2 to 12

Remote Command: There is no equivalent remote command.

Carrier Pwr Present

Specifies carriers which have power present.

1 Press the Carrier key and select the carrier number you wish to define, using the keyboard. (The carrier number selected is shown on the Carrier key.)

2 Toggle the Carrier Pwr Present key to indicate either Yes or No.

If a carrier is defined as having no power present, the power displayed will be relative to the reference carrier. If a carrier is defined as having power present, the absolute power will be displayed.

Carriers with power present are included in the total carrier power result.

Key Path: Meas Setup, Carrier Setup, Configure Carriers

Dependencies/Couplings: This key assigns a value (yes or no) to the carrier number displayed on the Carrier key.

State Saved: Saved in Instrument State.

Factory Preset: YES, YES, YES, YES

Range: Yes or No

Remote Command:

```
[:SENSe]:MCPower:CARRier:LIST:PPResent YES|NO

[:SENSe]:MCPower:CARRier:LIST:PPResent?
```

Remote Command Notes:

The position number in the list sent corresponds to the carrier number you are designating. For example: “YES, YES, NO, YES, YES, NO” defines six carriers. Carriers 1, 2, 4, and 5 are defined as having power present whereas carriers 3 and 6 do not have power present. If you need to change carrier 5, you must send all carriers up to 5. Carrier 6 will remain unchanged. If you send more values than the number of carriers specified using the Carriers key, (in this example, there are six carriers) they will be ignored.

The query for this parameter returns the current value for all carriers (with and without power present).

Example:

```
MCP:CARR:LIST:PPR YES,NO,YES,NO,YES

MCP:CARR:LIST:PPR?
```

Carrier Width

Specifies the width of each carrier including carriers with no power present. There is a corresponding one-to-one relationship between each carrier width value and the specified number of carriers.

1 Press the Carrier key and select the carrier number you wish to define. (The carrier number selected is shown on the Carrier key.)

2 Press the Carrier Width key and enter the width using the keyboard.

Key Path: Meas Setup, Carrier Setup, Configure Carriers

Key Notes: The Carrier key determines which carrier width you are defining.

State Saved: Saved in Instrument State.

Factory Preset: 5 MHz, 5 MHz, 5 MHz, 5 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator: Hz

Resolution: 1 Hz

Range: 0 Hz to 500 MHz

Remote Command:

```
:SENSe]:MCPower:CARRier:LIST:WIDTh <Hz>

[:SENSe]:MCPower:CARRier:LIST:WIDTh?
```

Remote Command Notes:

The position number of the each carrier width in the list sent corresponds to the carrier number you are defining. For example: “5 MHz, 10 MHz, 5 MHz” defines six carriers. Carriers 1, 2, 4, and 5 are defined as having power present whereas carriers 3 and 6 do not have power present. If you need to change carrier 5, you must send all carriers up to 5. Carrier 6 will remain unchanged. If you send more values than the number of carriers specified using the Carriers key, (in this example, there are six carriers) they will be ignored.

The query for this parameter returns the current value for all carriers (with and without power present).

Example:

```
MCP:CARR:LIST:WIDT 5 MHz,10 MHz,4 MHz,15 MHz,5 MHz,10 MHz

MCP:CARR:LIST:WIDT?
```

Carrier IntegBW

Defines the integration bandwidth used to calculate the power in the carriers.

Key Path: Meas Setup, Carrier Setup, Configure Carriers

State Saved: Saved in Instrument State.

SCPI Status Bits/OPC Dependencies: The integration bandwidth is specified differently depending on the radio standard selected. If Mode Setup, Radio Std, 3GPP W-CDMA is selected and the RRC filter is on, the actual integration bandwidth used will be the displayed integration bandwidth multiplied by (1 + filter alpha).

Factory Preset: 3.84 MHz, 3.84 MHz, 3.84 MHz, 3.84 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator Hz

Resolution:

Range: 100 Hz to 500 MHz

Remote Command:

```
[:SENSe]:MCPower:CARRier:LIST:BANDwidth|BWIDth
[:INTegration]<Hz>

[:SENSe]:MCPower:CARRier:LIST:BANDwidth|BWIDth
[:INTegration]?
```

Example: `MCP:CARR:LIST:BAND 3.5MHz,2.85MHz,3.84MHz`

Offsets/Limits

Displays menu keys that enable you to configure the offsets and limits for the MCP measurement.

Key Path: Meas Setup

Remote Command:

There is no equivalent remote command.

Offset A, B, or C

Enables you to select the offset the menu keys will affect.

Key Path: Meas Setup, Offset/Limits

Factory Preset: A

Remote Command: There is no equivalent remote command.

Offset Freq

Sets the frequency difference between the center of the uppermost carrier and the center of the upper element of the offset pair, as well as the frequency difference between the center of the lower element of the offset pair and the center of the lower most carrier. If you set the frequency of any offset to 0 Hz, the offset is turned off and not included in the displayed results.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: 5 MHz, 10 MHz, 15 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator: Hz

Range: 0 MHz to 45 MHz

Remote Command:

```
[:SENSe]:MCPower:OFFSet:LIST:[FREQuency]<Hz>,<Hz>,<Hz>
[:SENSe]:MCPower:OFFSet:LIST:[FREQuency]?
```

Example:

```
MCP:OFFS:LIST 5000HZ,7.5000HZ,15000HZ

MCP:OFFS:LIST?
```

Offset Integ BW

Sets the bandwidth over which the power is integrated for the selected offset (refer to "Offset" above).

Key Path: Meas Setup, Offset/Limits

Key Notes: If RRC Filter is set to On, the actual integration bandwidth used is the displayed integration bandwidth multiplied by (1 + Filter Alpha).

State Saved: Saved in Instrument State.

Factory Preset: 3.84 MHz, 3.84 MHz, 3.84 MHz

Terminators: Hz, kHz, MHz, GHz

Default Terminator: Hz

Range: 100 Hz to 20 MHz

Remote Command:

```
[:SENSe]:MCPower:OFFSet:LIST:BANDwidth|BWIDth:
[INTegration]<Hz>,<Hz>,<Hz>

[:SENSe]:MCPower:OFFSet:LIST:BANDwidth|BWIDth:
[INTegration]<Hz>,<Hz>,<Hz>
```

Example:

```
MCP:OFFS:LIST:BWIDth 5MHz,3MHz,5MHz

MCP:OFFS:LIST:BWID?
```

Upper Offset Limit

Sets the limit for the selected offset (refer to "Offset" above) to the right of the carriers.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: 0 dB, 0 dB, 0 dB

Default Terminator: dB

Range: –200 dB to 200 dB

Remote Command:

```
:CALCulate:MCPower:OFFSet:LIST:LIMit:POSitive[:UPPer]
:DATA <dB>,<dB>,<dB>
```

```
:CALCulate:MCPower:OFFSet:LIST:LIMit:POSitive[:UPPer]
:DATA?
```

Example:

```
:CALC:MCP:OFFS:LIST:LIM:POS:DATA -50dB,-55dB,-60dB
```

```
:CALC:MCP:OFFS:LIST:LIM:POS:DATA?
```

Lower Offset Limit

Sets the limit for the selected offset (refer to "Offset" above) to the left of the carriers.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: 0 dB, 0 dB, 0 dB

Default Terminator: dB

Range: –200 dB through 200 dB

Remote Command:

```
:CALCulate:MCPower:OFFSet:LIST:LIMit:NEGative[:UPPer]
```

```
:DATA <dB>,<dB>,<dB>
```

```
:CALCulate:MCPower:OFFSet:LIST:LIMit:NEGative[:UPPer]
```

```
:DATA?
```

Example:

```
CALC:MCP:OFFS:LIST:LIM:NEG:DATA -50dB,-55dB,-60dB
```

```
CALC:MCP:OFFS:LIST:LIM:NEG:DATA?
```

Carrier Result

Selects the result you wish to display on the last line of the carrier power results list except when:

- the carrier result number £ 4 (the first 4 carrier power results are displayed)
- the carrier result number Š 9 (the last 4 carrier power results are displayed)

Key Path: Meas Setup

Key Notes: This key is only available when Meas Control, Measure (Single) is selected.

State Saved: Not saved.

Factory Preset: 1

Range: 1 to number of carriers.

Remote Command:

There is no equivalent remote command.

Optimize Ref Level

Sets the input attenuator to optimize the robustness of the measurement, which is its freedom from errors due to input compression.

There will always be a minimum of 2 dB of attenuation set to reduce the potential errors due to VSWR.

Key Path: Meas Setup

State Saved: Not saved.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

Method

Enables you to set the measurement method to either the integration bandwidth method (IBW) or the resolution bandwidth method (RBW). The resolution bandwidth method is most useful for measuring cdmaOne and cdma2000 signals; the integration bandwidth method is preferred for other signals.

Key Path: Meas Setup

Key Notes: When Method is set to RBW, neither Noise Correction nor RRC Filter are available.

State Saved: Saved in Instrument State.

Factory Preset: IBW

Range: IBW|RBW

Remote Command:

```
[:SENSe]:MCPower:METHod IBW|RBW
```

```
[:SENSe]:MCPower:METHod?
```

Example:

```
MCP:METH IBW
```

```
MCP:METH?
```

Power Ref

Enables you to set the multi-carrier power reference to automatic or manual. When set to automatic, the carrier power result reflects the measured power value in the selected reference carrier (Meas Setup, Carrier Setup, Ref Carrier). When set to manual, the result is referenced to the last measured value, or you may specify the reference for the multi-carrier power measurement. Relative values are displayed, referenced to the "Power Reference" value.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Off/Measured power in the reference carrier.

Terminators: dBm

Default Terminator: dBm

Range: –200 dBm to 200 dBm

Remote Command:

```
[:SENSe]:MCPower:CARRier:AUTO[:STATe] OFF|ON|0|1
[:SENSe]:MCPower:CARRier:AUTO[:STATe]?
[:SENSe]:MCPower:CARRier[:POWer]<dBm>
[:SENSe]:MCPower:CARRier[:POWer]?
```

Example:

```
MCP:CARR:AUTO 0
MCP:CARR:AUTO?
MCP:CARR -100
MCP:CARR?
```

Limit Test

Turns the testing of the limit line on or off. When Limit Test is set to On, each offset is compared to its upper and lower offset limit. In those cases where the power exceeds the limit, a red "F" is placed next to the dBc result to indicate a failure. If there are any failures, the pass/fail indicator area show "FAIL" in red; if there are none, it shows "PASS" in green. Any offsets that are in the off state (see "Offset Freq" on page 159) are not measured and their results will not be displayed on screen.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:MCPower:LIMit[:STATe] OFF|ON|0|1
```

```
[:SENSe]:MCPower:LIMit[:STATe]?
```

Example:

```
MCP:LIM ON
```

```
MCP:LIM?
```

RRC Filter

Turns the Root Raised Cosine filter on or off for the carriers and all adjacent channels. The RRC filter is the type specified in the 3GPP W-CDMA standards, with rolloff (a) = Filter Alpha parameter (defined below).T is set to 1/Carrier Integ BW (for carriers) or 1/Offset Integ BW (for Offsets).

Key Path: Meas Setup

Key Notes: This key is not available when Meas Setup, Method (RBW) is selected.

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:MCPower:FILTer[:RRC][:STATe] OFF|ON|0|1
```

```
[:SENSe]:MCPower:FILTer[:RRC][:STATe]?
```

Example:

```
MCP:FILT 1
```

```
MCP:FILT?
```

Filter Alpha

Inputs the alpha value for the RRC Filter. This parameter is only available when 3GPP W-CDMA or None has been selected as the radio standard from the Mode Setup menu.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 0.22 when W-CDMA is selected, otherwise Off.

Range: Off/On

Remote Command:

```
[:SENSe]:MCPower:FILTer[:RRC]:ALPHA <number>
[:SENSe]:MCPower:FILTer[:RRC]:ALPHA?
```

Example:

```
MCP:FILT:ALPHA .33
MCP:FILT:ALPHA?
```

Noise Correction

Turns noise correction on or off. When you set Noise Correction to On, a calibration of the noise floor is performed and used to correct for N8201A noise floor contribution to measurement levels, increasing dynamic range.

Key Path: Meas Setup

Key Notes: This key is not available when Meas Setup, Method (RBW) is selected or when signal tracking is on.

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:MCPower:CORRection:NOISe[:AUTO] OFF|ON|0|1
```

```
[:SENSe]:MCPower:CORRection:NOISe[:AUTO]?
```

Remote Command Notes:

The noise correction feature is not available when the measurement method is RBW (Meas Setup, Method (RBW) or when signal tracking is on.

Example:

```
MCP:CORR:NOIS 1
```

```
MCP:CORR:NOIS?
```

Meas Setup (Power Stat Complementary Cumulative Distribution Function—CCDF)

When Power Stat CCDF has been selected in the Measure menu of the Spectrum Analysis mode, this key displays the appropriate measurement setup menu for the complementary cumulative distribution function (CCDF).

Power Complementary cumulative distribution function (CCDF) curves characterize the higher-level power of the signal. It provides the distribution of peak-to-average power ratios versus probability. A CCDF curve is defined by how much time the waveform spends at or above the specified power level. The percent of time the signal spends at or above this level defines the probability for that particular power level.

Key Path: Front-panel key

Remote Command:

There is no equivalent remote command.

Meas BW

Sets the measurement 3 dB bandwidth.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Defined by the radio standard selected.

Terminators: Hz, kHz, MHz, GHz

Range: 10 kHz to 5MHz

Remote Command:

```
[:SENSe]:PSTatistic:BANDwidth|BWIDth <freq>
[:SENSe]:PSTatistic:BANDwidth|BWIDth?
```

Remote Command Notes:

The entered value is rounded to the nearest Res BW filter frequency.

This command is coupled with the N8201A resolution bandwidth.

Example:

```
PST:BAND 10 or PST:BWID 10
PST:BAND? or PST:BWID?
```

Counts

Sets the accumulated number of sampling points for data acquisition. The range is 1 kpoints (kilopoint–1000 points) to 2.000000 Gpoints (Giga point–109 point) with 1 kpoint resolution. Enter a value using the keyboard.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 1.00e5

Range: 1e3 to 1e9

Remote Command:

```
[:SENSe]:PSTatistic:COUNts <integer>
[:SENSe]:PSTatistic:COUNts?
```

Example:

```
PST:COUN 1.0e6
PST:COUNt?
```

Meas Interval

Specifies the time interval over which the measurement is made. The minimum setting is 100 ms. The maximum setting depends on the measurement bandwidth setting but never exceeds 600 ms. The resolution is 1 ms.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 1.0ms

Default Terminator: s

Range: 100 ms to 600 ms

Remote Command:

```
[:SENSe]:PSTatistic:SWEep:TIME <time>
```

```
[:SENSe]:PSTatistic:SWEep:TIME?
```

Example:

```
PST:SWE:TIME 1.0e-3
```

```
PST:SWE:TIME?
```

Optimize Ref Level

Sets the input attenuator to optimize the robustness of the measurement, which is its freedom from errors due to input compression.

There will always be a minimum of 2 dB of attenuation set to protect the N8201A input.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

Meas Setup (Harmonic Distortion)

When the harmonic distortion measurement has been selected in the Measure key menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

Key Path: Front-Panel key

Dependencies/Couplings: This measurement is not available when external mixing has been selected.

Saved State: Not saved.

Avg Number

Specifies the number of measurement averages used when calculating the measurement result. The average will be displayed at the end of each sweep.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 averages / Off

Range: 1 to 1000

Remote Command:

```
[:SENSe]:HARMonics:AVERage:COUNt <integer>
[:SENSe]:HARMonics:AVERage:COUNt?
[:SENSe]:HARMonics:AVERage[:STATe] OFF|ON|0|1
[:SENSe]:HARMonics:AVERage[:STATe]?
```

Example:

```
HARM:AVER:COUN 100
HARM:AVER ON
```

Avg Mode

Selects the type of termination control used for the averaging function to either Exp or Repeat. This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode) When you set Avg Mode to Exp, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

Repeat When you set Avg Mode to Repeat, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: EXPonential

Range: EXPonential|REPeat

Remote Command:

```
[:SENSe]:HARMonics:AVERage:TCONrol EXPonential|REPeat
[:SENSe]:HARMonics:AVERage:TCONrol?
```

Example:

```
HARM:AVER:TCON EXP
HARM:AVER:TCON?
```

Harmonics

Harmonics indicates the number of harmonics to measure before computing the total harmonic distortion. The minimum number is 2 (only the fundamental and second harmonic will be measured). The maximum number is 10.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10

Range: 2 to 10

Remote Command:

```
[:SENSe]:HARMonics:NUMBer <integer>
```

```
[:SENSe]:HARMonics:NUMBer?
```

Example:

```
HARM:NUMB 5
```

ST/Harmonic

Sets the sweep time used to measure each harmonic. The value is set to 200 divided by the resolution bandwidth, or 10 ms, whichever is greater when the measurement is started. This sweep time is used only for measuring harmonics. The N8201A sweep time before the measurement was started is used for finding the fundamental.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 ms / Auto

Default Terminator: seconds

Range: 10 ms to maximum sweep time of the N8201A.

Remote Command:

```
[:SENSe]:HARMonics:SWEeptime:STATe OFF|ON|0|1
[:SENSe]:HARMonics:SWEeptime:STATe?
[:SENSe]:HARMonics:SWEeptime <time>
[:SENSe]:HARMonics:SWEeptime?
```

Remote Command Notes:

ON is equal to automatic (Auto). OFF is equal to manual (Man).

Example:

```
HARM:SWE:STAT OFF
HARM:SWE 100 ms
```

Range Table (On/Off)

Specifies whether the range table is to be used or not. When Range Table is set to Off the harmonics are measured. When Range Table is set to On the first active range is considered to be the fundamental and the subsequent active ranges are used as the harmonics. At least two ranges must be active if Range Table is set to On.

Key Path: Meas Setup

Factory Preset: Table 6 on page 338.

Range: Off|On

Remote Command:

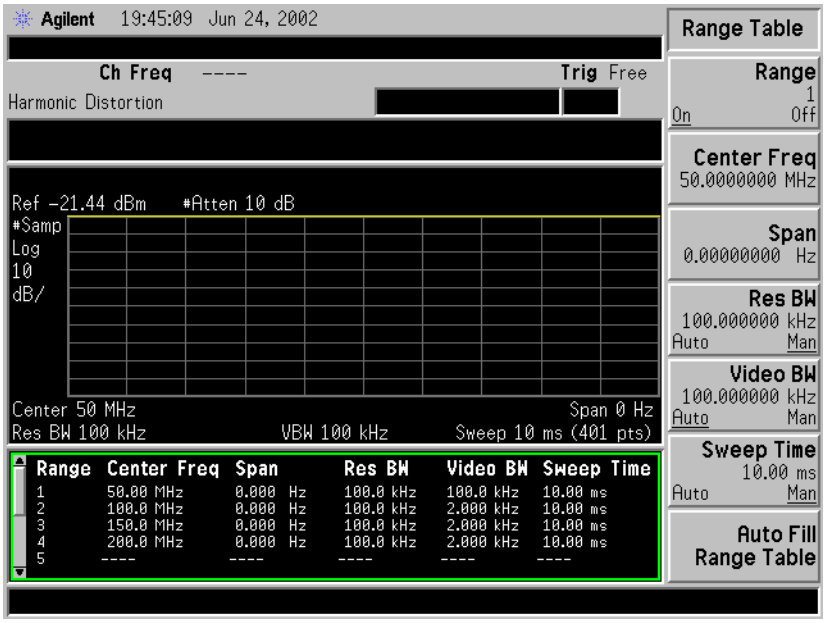
```
[:SENSe]:HARMonics:RTABle:STATe OFF|ON|0|1
[:SENSe]:HARMonics:RTABle:STATe?
```

Example:

```
HARM:RTAB:STAT OFF
```

Range Table

Enables you to enter the settings for up to 10 ranges, either using the instrument front panel keys or remotely. Upon entering the range table, the measurement stops, then the N8201A is set to a constantly sweeping state. The N8201A is then set to the current values for range 1 (whether range 1 is on or off). If a range is currently off, the values in the range table for that range are replaced with --- (see Range 5 in the illustration) to indicate this range is currently inactive.



Key Path: Meas Setup

Saved State: All values for all ranges are saved in Instrument State.

Factory Preset: For each range, the following settings are selected: Range State(On), Zero Span, Res BW Mode(Man), Video BW(Man) is set to 2 kHz, and Sweep Time Mode(Auto) is set to 10 ms. The table below defines the other default parameter settings for the measurement.

Table 6 Range Table Default Settings

Range	Center Freq (GHz)	Res BW (kHz)
1	1.000	100.0
2	2.000	200.0
3	3.000	300.0

Table 6 Range Table Default Settings

Range	Center Freq (GHz)	Res BW (kHz)
4	4.000	430.0
5	5.000	510.0
6	6.000	620.0
7	7.000	750.0
8	8.000	820.0
9	9.000	910.0
10	10.00	1000.0

Remote Command:

There is no equivalent remote command.

Range

Selects a range and updates the values on the other Range Table keys so that they reflect the settings for the selected range. If Range is set to On it is used as part of the measurement; when set to Off it is excluded. A range is made up of the next parameters.

Key Path: Meas Setup, Range Table

Factory Preset: Table 6.

Range: Off|On

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted. For example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values remain as they were.

```
[:SENSe]:HARMonics:RANGe[:LIST]:STATe OFF|ON|0|1
```

The query for this parameter will always return 20 values.

```
[:SENSe]:HARMonics:RANGe[:LIST]:STATe?
```

Example: `HARM:RANG:LIST:STAT ON,OFF,ON,ON`

Center Freq

Used to set the center frequency of the N8201A.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 6.

Range: Frequency range of your N8201A.

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:HARMonics:RANGe[:LIST]:FREQuency <integer>
```

The query for this parameter will always return 10 values.

```
[:SENSe]:HARMonics:RANGe[:LIST]:FREQuency?
```

Example: `HARM:RANG:LIST:FREQ 300`

Span

Span is used to set the span of the N8201A.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 6.

Range: Span of your N8201A.

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:HARMonics:RANGe[:LIST]:SPAN
```

```
[:SENSe]:HARMonics:RANGe[:LIST]:SPAN?
```

Res BW

Sets the resolution bandwidth mode of the N8201A. If the range is zero span and Res BW is set to Auto, the N8201A determines the optimum setting. Res BW set to Man enables you to determine the setting.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 6.

Range: Resolution bandwidth range of your N8201A.

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth
[:RESolution]
```

`:AUTO OFF|ON|0|1` selects the mode.

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth
[:RESolution]<integer>
```

The query for this parameter always returns 10 values.

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth
[:RESolution]:AUTO?
```

```
[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth
[:RESolution]?
```

Video BW

Sets the video bandwidth of the N8201A. When Auto is selected the N8201A determines the optimum setting, while Man enables you to determine the setting.

Key Path: Meas Setup, Range Table

Factory Preset: Auto

Range: Video bandwidth range of the N8201A.

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth:VIDeo :AUTO OFF|ON|0|1` selects the mode.

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth:VIDeo <integer>`

The query for this parameter will always return 10 values.

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth :VIDeo:AUTO?`

`[:SENSe]:HARMonics:RANGe[:LIST]:BWIDth|BANDwidth:VIDeo?`

Sweep Time

Sets the sweep time of the N8201A. If the range is zero span and Sweep Time is set to Auto, the sweep time will be 200 divided by the resolution bandwidth or 10 ms, whichever is greater. If the range is non zero span and Sweep Time is set to Auto, the N8201A determines the optimum setting. Sweep Time set to Man enables you to determine the setting.

Key Path: Meas Setup, Range Table

Factory Preset: Auto

Range: Sweep time range of your N8201A.

Remote Command:

This parameter can send up to 10 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME:AUTO OFF|ON|0|1` selects the mode.

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME: <integer>`

The query for this parameter will always return 10 values.

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME:AUTO?`

`[:SENSe]:HARMonics:RANGe[:LIST]:SWEep:TIME?`

Auto Fill Range Table

Automatically sets up the range table based on the current range center frequency and span. When selected, the current center frequency is taken as the fundamental and the frequency in range one is set to this value. Each of the subsequent range center frequency parameters are set to the appropriate integer multiple of the fundamental frequency. The span for range one is set to that of the current range. Each of the subsequent range span parameters are set to the appropriate integer multiple of the fundamental span. This means that if the fundamental range is zero span, all the ranges will be zero span. If the range span is zero, Res BW, Video BW, and Sweep Time are set to the current base instrument settings. If the range span is non-zero, Res BW, Video BW, and Sweep Time for all harmonics are set to the same settings as for the fundamental. Span is set to zero for all harmonics and the fundamental.

Key Path: Meas Setup, Range Table

Range: Sweep time range of your N8201A.

Remote Command: `[:SENSe]:HARMonics:RTABle:FILL <no query>`

Example: `HARM:RTAB:FILL`

Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

There will always be a minimum of 2 dB of attenuation set to reduce the potential errors due to VSWR.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

Meas Setup (Burst Power)

When Burst Power has been selected in the Measure menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

The burst power measurement is an accurate method of determining the average power for the specified burst.

1 Select RF Burst Setup. (Trig, RF Burst Setup)

2 Set the trigger level mode to relative. (Trigger Level (Rel)

3 Set the narrow pulse discriminator to off. (Narrow Pulse Discriminator (Off)

4 Set the threshold level to –30 dB. (Meas Setup, Threshold Lvl, – 3, 0, dB)

Key Path: Front-panel key

Remote Command:

There is no equivalent remote command.

Avg Number

Specifies the number of measurement averages used when calculating the measurement result. The average is displayed at the end of each sweep.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 averages / Off

Range: 1 to 1000

Remote Command:

```
[:SENSe]:BPOWer:AVERage:COUNt <integer>
[:SENSe]:BPOWer:AVERage:COUNt?
[:SENSe]:BPOWer:AVERage[:STATe] OFF|ON|0|1
[:SENSe]:BPOWer:AVERage[:STATe]?
```

Example:

```
BPOW:AVER:COUN 100
BPOW:AVER ON
```

Avg Mode

Selects the type of termination control used for the averaging function to either Exp or Repeat. This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode) When you set Avg Mode to Exp, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

Repeat When you set Avg Mode to Repeat, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: EXPonential

Range: EXPonential|REPeat

Remote Command:

```
[:SENSe]:BPOWer:AVERage:TCONrol EXPonential|REPeat
[:SENSe]:BPOWer:AVERage:TCONrol?
```

Example:

```
BPOW:AVER:TCON EXP
BPOW:AVER:TCON?
```

Average Type

Allows you to specify the type of result averaging to be performed.

Log Selects averaging that sums the trace data and divides by the number of data points.

RMS Selects averaging that converts trace data from dB to power units, then averages the power trace data. This selection requires more time to perform.

Key Path: Meas Setup

Factory Preset: RMS

Range: RMS or Log

Remote Command:

`[:SENSe]:BPOWer:AVERage:TYPe LPOWer|POWer`

`[:SENSe]:BPOWer:AVERage:TYPe?`

Example:

`BPOW:AVER:TYP LPOWer` to select Log type.

`BPOW:AVER:TYP?`

Threshold Lvl

Enables you to set the level above which the mean carrier power calculation is based. The threshold level can be described in dB (Rel) or dBm (Abs).

Key Path: Meas Setup

Factory Preset: -30 dB

Terminators: dB or dBm

Default Terminator dB

Range:

–60 dBm to 60 dBm (in absolute mode)

–60 dB to 0 dB (in relative mode)

Remote Command:

```
[:SENSe]:BPOWer:THReshold <number>
[:SENSe]:BPOWer:THReshold?
[:SENSe]:BPOWer:THReshold:TYPE ABSolute|RELative
[:SENSe]:BPOWer:THReshold:TYPE?
```

Example:

```
SENS:BPOW:THR:TYPE ABS
```

Meas Method

Allows you to select the measurement method.

Above Threshold Lvl Selects the user defined threshold level or default level (–3.00 dB) as the criteria in making the measurement.

Measured Burst Width This measurement method is not available for the following radio standards: IS-95, J-STD-008, cdma2000-SR1, cdma2000-SR3, W-DCMA 3GPP.

The measurements described above are those available in SA mode (see Mode key). Other measurements are available in other modes if an optional personality is installed.

Key Path: Meas Setup

Factory Preset: Above Threshold Lvl (THReshold)

Range: Measured Burst Width (BWIDth) to Above Threshold Lvl (THReshold)

Remote Command:

```
[:SENSe]:BPOWer:METHod THReshold|BWIDth
[:SENSe]:BPOWer:METHod?
```

Example:

`BPOW:METH BWID` to select burst width as the measurement method.

Burst Width

Sets the burst width parameter to automatic mode (Auto) or manual mode (Man).

Auto The burst width is automatically calculated based on the threshold level. For example, if the threshold level is set to 3 dB, the burst width will be the time between the two 3 dB points. This will update after each sweep, but before any results are calculated. Since the measurement only measures over the burst width, this will force a measurement between the 3 dB points.

Man The burst width used for computing the burst power is controlled by either entering it directly or as a percentage of the measured burst width. In the percentage case, the burst width is computed just once based on the most recent measured burst width. In either case, the burst width is centered on the observed burst in each measurement.

This key will be grayed out if Meas Method is set to Above Threshold Lvl.

Key Path: Meas Setup

Factory Preset: 542.77 ms

Terminators: %, s, ms, ns (% from front panel only)

Default Terminator: seconds (s)

Range: 0.1 ms to 2 ks

Remote Command:

```
[:SENSe]:BPOWer:BURSt:WIDTh <time>
[:SENSe]:BPOWer:BURSt:WIDTh?
[:SENSe]:BPOWer:BURSt:AUTO OFF|ON|0|1
[:SENSe]:BPOWer:BURSt:AUTO?
```

Remote Command Notes:

Burst width cannot be set remotely as a percent of the current burst width. That functionality is available from the front panel, but the command must be sent with a time value.

Example:

```
SENS:BPOW:BURST:AUTO ON
```

Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

There will always be a minimum of 2 dB of attenuation set to protect the N8201A input.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

Meas Setup (Intermod (TOI))

When Intermod (TOI) measurement has been selected in the Measure menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu for third order intercept (TOI).

The TOI measurement computes and displays the output intercept point (IP3), and places markers upon the trace to indicate the measured signals and third-order products. The span must be wide enough so that the signals and their intermod products are visible on the display. Otherwise the TOI signal pattern cannot be identified and the measurement routine will not function.

Key Path: Front-panel key

Dependencies/Couplings: Menu changes depending on the Mode and Measurement selected.

Remote Command:

There is no equivalent remote command.

Avg Number

Set Avg Number to On to specify the number of measurement averages used when calculating the measurement result. The average will be displayed at the end of each sweep. Setting Avg Number to Off disables measurement averaging.

Key Path: Meas setup

State Saved: Saved in Instrument State.

Factory Preset: 10 averages / Off

Range: 1 through 1000

Remote Command:

```
[:SENSe]:TOIN:AVERage:COUNt <integer>
[:SENSe]:TOIN:AVERage:COUNt?
[:SENSe]:TOIN:AVERage[:STATe] OFF|ON|0|1
[:SENSe]:TOIN:AVERage[:STATe]?
```

Example:

```
TOI:AVER ON
TOI:AVER?
```

Avg Mode

Press Avg Mode to select the type of termination control used for the averaging function to either Exp or Repeat. This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode)—When you set Avg Mode to Exp, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

Repeat—When you set Avg Mode to Repeat, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: EXPonential

Remote Command:

```
[:SENSe]:TOIN:AVERage:TCONrol EXPonential|REPeat
[:SENSe]:TOIN:AVERage:TCONrol?
```

Example:

```
TOIN:AVER:TCON EXP
TOIN:AVER:TCON?
```

TOI Span

Press Span to specify the frequency span in which intermodulation products are measured.

Key Path: Meas Setup

Key Note: If you modify the value of Span in the base instrument Span menu, the value in the Meas Setup menu will be updated to reflect the new value and the measurement will restart if it is running.

Factory Preset: 15 MHz, or as defined by the radio standard selected.

Range: Non-Zero Span of N8201A

Remote Command:

```
[:SENSe]:TOIN:FREQuency:SPAN <number>
```

```
[:SENSe]:TOIN:FREQuency:SPAN?
```

Example:

```
TOIN:FREQ:SPAN 20 MHz
```

```
TOIN:FREQ:SPAN?
```

Max Mixer Lvl

Enables you to set the relationship between the highest signal that can be displayed (the reference level) and the input attenuation. The relationship applies whenever the Attenuation is set to Auto. The relationship is that the attenuation is given by reference level minus the max mixer level. For example, as the reference level changes, the input attenuator changes to ensure that a signal at the reference level does not exceed the Max Mixer Lvl setting.

When the TOI measurement is on, this key controls the maximum mixer level, independent of the previous setting of Max Mixer Lvl located under Amplitude. When the TOI measurement is Off, the previous maximum Max Mixer Lvl is restored.

Setting Max Mixer Lvl to Auto sets the maximum mixer level to –30 dBm.

Key Path: Meas Setup

Factory Preset: –30.00 dBm/Auto

Range: 0 VDC, +30 dBm

Remote Command:

```
[:SENSe]:TOIN:FREQuency:MIXer:RANGe[:UPPer] <number>
[:SENSe]:TOIN:FREQuency:MIXer:RANGe[:UPPer]?
[:SENSe]:TOIN:FREQuency:MIXer:RANGe:AUTO OFF|ON|0|1
[:SENSe]:TOIN:FREQuency:MIXer:RANGe:AUTO?
```

Example:

```
TOIN:FREQ:MIX:RANG -10 dBm
TOIN:FREQ:MIX:RANG?
TOIN:FREQ:MIX:RANG:AUTO 1
TOIN:FREQ:MIX:RANG:AUTO?
```

Optimize Ref Level

Sets the reference level to place the tones near the top of the display. When input attenuation is set to Auto, pressing Optimize Ref Level sets the input attenuation according to the auto rules described in Max Mixer Lvl, based on this reference level. You may want to trade off N8201A noise and N8201A-induced distortion by manually changing the attenuation setting from this starting point.

There is always a minimum of 2 dB of attenuation set to protect the N8201A input.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

```
POW:RANG:AUTO?
```

Meas Setup (Spurious Emissions)

When the spurious emissions measurement has been selected in the Measure menu of the Spectrum Analysis mode, this key displays the appropriate measurement setup menu.

The spurious emissions measurement identifies and determines the power level of spurious emissions in certain frequency bands.

Key Path: Front-panel key

Remote Command:

There is no equivalent remote command.

Avg Number

Specifies the number of measurements that will be averaged when calculating the measurement result. The average will be displayed at the end of each sweep. Off disables the measurement averaging.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 averages / Off

Range: 1 to 1000

Remote Command:

```
[:SENSe]:SPURious:AVERage:COUNt <integer>

[:SENSe]:SPURious:AVERage:COUNt?

[:SENSe]:SPURious:AVERage[:STATe] OFF|ON|0|1 turns the
averaging on or off.

[:SENSe]:SPURious:AVERage[:STATe]?
```

Example:

```
SPUR:AVER:COUN 10

SPUR:AVER OFF
```

Avg Mode

Selects the type of termination control used for the averaging function (Exp or Repeat). This determines the averaging action after the specified number of measurements (average count) is reached.

EXP (Exponential Averaging mode) When you set Avg Mode to Exp, each successive data acquisition after the average count is reached is exponentially weighted and combined with the existing average. Exponential averaging weights new data more than old data, which facilitates tracking of slow-changing signals. The average will be displayed at the end of each sweep.

Repeat When you set Avg Mode to Repeat, after reaching the average count, all previous result data is cleared and the average count is set back to 1.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: EXPonential

Range: EXPonential|REPeat

Remote Command:

```
[:SENSe]:SPURious:AVERage:TCONrol EXPonential|REPeat
```

```
[:SENSe]:SPURious:AVERage:TCONrol?
```

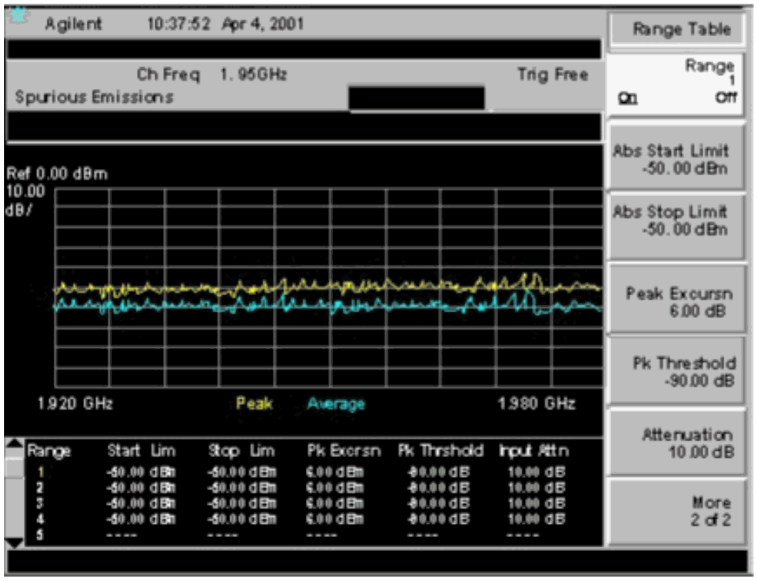
Example:

```
SPUR:AVER:TCON EXP
```

```
SPUR:AVER:TCON?
```

Range Table

Enables you to enter the settings for up to 20 ranges, either using the instrument front panel keys or remotely. Upon entering the range table, the measurement stops, then the N8201A is set to a constantly sweeping idle state. The N8201A is then set to the current values for range 1 (whether range 1 is on or off). If a range is currently off, the values in the range table for that range are replaced with --- (see Range 5 in the illustration) to indicate this range is currently inactive.


Agilent 10:37:52 Apr 4, 2001
Ch Freq 1.95GHz
Trig Free
Spurious Emissions
Ref 0.00 dBm
10.00
dB/
1.920 GHz
Peak
Average
1.980 GHz
Range Start Lim Stop Lim Pk Excrsn Pk Thrshold Input Attn
1 -50.00 dBm -50.00 dBm 6.00 dBm -90.00 dB 10.00 dB
2 -50.00 dBm -50.00 dBm 6.00 dBm -90.00 dB 10.00 dB
3 -50.00 dBm -50.00 dBm 6.00 dBm -90.00 dB 10.00 dB
4 -50.00 dBm -50.00 dBm 6.00 dBm -90.00 dB 10.00 dB
5 ---- ---- ---- ---- ----
Range Table
Range 1
On Off
Abs Start Limit -50.00 dBm
Abs Stop Limit -50.00 dBm
Peak Excursn 6.00 dB
Pk Threshold -90.00 dB
Attenuation 10.00 dB
More 2 of 2

Key Path: Meas Setup

Saved State: All values for all ranges are saved in Instrument State.

Factory Preset: For each range, the following settings are selected:

Video BW (Auto),

Sweep Time (Auto),

Absolute Limit = - 50 dBm,

Peak Threshold = - 90 dBm,

Peak Excursion = 6 dB, and

Abs Stop Limit Mode (Auto) is set to -50 dBm

Attenuation (Auto)

Detector 1 = Peak

Detector 2 = Off

Points = (Man) 601

The table below defines the other parameter's settings for the measurement. The values for ranges 1 through 5 are based on the W-CDMA (3GPP) BTS Spurious Emission measurement.

Table 7 Range Table Default Settings

Range	Start Freq (GHz)	Stop Freq (GHz)	Res BW (kHz)
1	1.920	1.980	1200
2	1.894	1.920	510
3	2.100	2.102	100
4	2.175	2.180	100
5	0.800	1.000	4000
6-20	1.5	2.5	Auto

Remote Command: There is no equivalent remote command.

Range

Selects a range and updates the values on the other Range Table keys so that they reflect the settings for the selected range. If Range is set to On it is used as part of the measurement; when set to Off it is excluded.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 7.

Range: Off|On

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted. For example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values remain as they were.

`[:SENSe]:SPURious[:RANGe][:LIST]:STATe OFF|ON|0|1`

The query for this parameter will always return 20 values.

`[:SENSe]:SPURious[:RANGe][:LIST]:STATe?`

Example: `SPUR:STAT OFF,ON,ON,OFF,ON,ON` lists values 1 through 6

Start Freq

Used to set the start frequency of the N8201A.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 7 on page 363.

Range: Frequency range of your N8201A.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STARt <integer>
```

The query for this parameter will always return 20 values.

```
[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STARt?
```

Stop Freq

Stop Freq is used to set the stop frequency of the N8201A.

Key Path: Meas Setup, Range Table

Factory Preset: See "Range Table" on page 204.

Range: Frequency range of your N8201A.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STOP
<integer>
```

The query for this parameter will always return 20 values.

```
[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STOP?
```

Res BW

Sets the resolution bandwidth of the N8201A. When Auto is selected the N8201A determines the optimum setting, while Man enables you to determine the setting.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 7 on page 363.

Range: Resolution bandwidth range of your N8201A.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

`[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]:AUTO OFF|ON|0|1` selects the mode.

`[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]<integer>`

The query for this parameter always returns 20 values.

`[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]:AUTO?`

`[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]?`

Video BW

Sets the video bandwidth of the N8201A. When Auto is selected the N8201A determines the optimum setting, while Man enables you to determine the setting.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 7 on page 363.

Range: Video bandwidth range of your N8201A.

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo :AUTO OFF|ON|0|1 selects the mode.

[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo <integer>

The query for this parameter will always return 20 values.

[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo :AUTO?

[:SENSe]:SPURious[:RANGe][:LIST]:BWIDth|BANDwidth:VIDeo?

Sweep Time

Sets the sweep time of the N8201A. When Auto is selected the N8201A determines the optimum setting, while Man enables you to determine the setting.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 7 on page 363.

Range: Sweep time range of your N8201A.

Remote Command:

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO OFF|ON|0|1, OFF|ON|0|1

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO?

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME: <time>, <time>,... (up to 20 sweeptimes)

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME?

Remote Command Notes:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

The query for this parameter will always return 20 values.

Example:

SPURious:SWEep:TIME:AUTO ON,OFF,ON

SPURious:SWEep:TIME 4ms,10ms

Abs Start Limit

Sets the absolute start limit to the set value, then sets the absolute stop limit to the same value as the start limit. Any spurs located above the current setting of Peak Excursn and Threshold will be added to the results table. A red “F” will be appended to the amplitude value of the spur if the measured amplitude of the spur is above the limit set with Abs Start Limit.

Key Path: Meas Setup, Range Table

Dependencies/Couplings: If the limit is set to Auto, Abs Start Limit and Abs Stop Limit are coupled to make a flat limit line. If set to Man, the absolute start and stop limits can take different values to make a sloped limit line.

Factory Preset: See Table 7 on page 363.

Range: –150 dBm to 50 dBm

Remote Command:

```
:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]
:DATA:STARt <integer>
```

```
:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]
:DATA:STARt?
```

Remote Command Notes:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

The query for this parameter will always return 20 values.

Related commands are:

```
SPURious:SWEep:TIME:AUTO?
```

```
SPURious:SWEep:TIME?
```

Abs Stop Limit

Determines the limit above which spurs will report a failure. If any spurs are located above the current setting of Peak Excursn will be added to the results table. A red F will be appended to the amplitude value of the spur if the measured amplitude of the spur is above the limit set with Abs Stop Limit.

Key Path: Meas Setup, Range Table

Dependencies/Couplings: If the limit is set to Auto, Abs Start Limit and Abs Stop Limit are coupled to make a flat limit line. If set to Man, the absolute start and stop limits can take different values to make a sloped limit line.

Factory Preset: See Table 7 on page 363.

Range: –150 dBm to 50 dBm

Remote Command:

```
:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]
:DATA:STOP <integer>,<integer>
:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]
:DATA:STOP?
:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]
:DATA:STOP:AUTO OFF|ON|0|1, OFF|ON|0|1
:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPER]
:DATA:STOP:AUTO?
```

Remote Command Notes:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

The query for this command will always return 20 values.

Example:

```
:CALC:SPUR:LIM:ABS:DATA -23,-27
:CALC:SPUR:LIM:ABS:DATA:AUTO ON, ON, ON, ON
```

Peak Excursn

Sets the minimum amplitude variation of signals that can be identified as peaks. For example, if a value of 6 dB is selected, peaks that rise and fall more than the 6 dB above the peak threshold value are identified.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 7 on page 363.

Range: 0.0 dB to 100.0 dB

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:EXCursion <integer>
```

The query for this parameter will always return 20 values.

```
[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:EXCursion?
```

Pk Threshold

Sets the minimum amplitude of signals that can be identified as peaks. For example, if a value of –90 dBm is selected, only peaks that rise and fall more than the peak excursion value and are above the Pk Threshold of –90 dBm are identified.

Key Path: Meas Setup, Range Table

Factory Preset: See Table 7 on page 363.

Range: –100 dB to 0.0 dB

Remote Command:

This parameter can receive up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6, you must send all values up to 6. Subsequent values will remain as they were.

```
[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:THReshold <integer>
```

The query for this parameter will always return 20 values.

```
[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:THReshold?
```

Attenuation

Sets the attenuation for each range. This parameter can send up to 20 values. The location in the list sent corresponds to the range the value is associated with. Missing values are not permitted, for example, if you want to change values 2 and 6 you must send all values up to 6. Subsequent values will remain as they were.

Key Path: Meas Setup, Range Table

State Saved: Saved in Instrument State.

Factory Preset: Auto, the value is determined by the radio standard and the instrument model.

Range: 0 to 70 dB

Remote Command:

```
[:SENSe]:SPURious[:RANGe][:LIST]:ATTenuation
[:SENSe]:SPURious[:RANGe][:LIST]:ATTenuation?
```

Remote Command Notes:

The query always returns 20 values

Example: `SPUR:ATT 20,20,20,20,20,20`

Detector 1

Allows you to set the detector to be used by the trace which will be used for display purposes only.

The detector choices are:

Normal - displays the peak of CW-like signals and maximums and minimums of noise-like signals.

Average - displays the average of the signal within the bucket. The averaging method depends upon Avg Type selection (voltage, power or log scales).

Peak - displays the maximum of the signal within the bucket.

Sample - displays the instantaneous level of the signal at the center of the bucket represented by each display point.

Negative Peak - displays the minimum of the signal within the bucket.

Quasi Peak - a fast-rise, slow-fall detector used in making CISPR compliant EMI measurements.

EMI Average - displays the instantaneous level of the signal at the center of the bucket, just like the sample detector. Also changes the auto coupling of VBW, RBW and Avg/VBW Type and the set of available RBWs. Used in making CISPR-compliant measurements.

EMI Peak - the same as the Peak detector but uses CISPR related bandwidths.

MIL Peak - the same as the Peak detector but uses MIL related bandwidths.

Key Path: Meas Setup, Range Table

State Saved: Saved in Instrument State.

Factory Preset: Auto, the value is determined by the radio standard and the instrument model.

Range: 0 to 70 dB

Remote Command:

```
[:SENSe]:SPURious[:RANGe][:LIST]:DETector[1]|2 [:FUNCtion]
NORMal|AVERage|POSitive|SAMPle|NEGative|QPEak|EAVerage|
EPOSitive|MPositive
```

```
[:SENSe]:SPURious[:RANGe][:LIST]:DET?
```

Example: `SPUR:DET QPE`

Detector 2

Allows you to set the detector to be used by the trace which will be used for display purposes only.

The detector choices are:

Normal - displays the peak of CW-like signals and maximums and minimums of noise-like signals.

Average - displays the average of the signal within the bucket. The averaging method depends upon Avg Type selection (voltage, power or log scales).

Peak - displays the maximum of the signal within the bucket.

Sample - displays the instantaneous level of the signal at the center of the bucket represented by each display point.

Negative Peak - displays the minimum of the signal within the bucket.

Quasi Peak - a fast-rise, slow-fall detector used in making CISPR compliant EMI measurements.

EMI Average - displays the instantaneous level of the signal at the center of the bucket, just like the sample detector. Also changes the auto coupling of VBW, RBW and Avg/VBW Type and the set of available RBWs. Used in making CISPR-compliant measurements.

EMI Peak - the same as the Peak detector but uses CISPR related bandwidths.

MIL Peak - the same as the Peak detector but uses MIL related bandwidths.

Off - turns off second trace (Detector 2).

Key Path: Meas Setup, Range Table

State Saved: Saved in Instrument State.

Factory Preset: Auto, the value is determined by the radio standard and the instrument model.

Range: 0 to 70 dB

Remote Command:

```
[:SENSe]:SPURious[:RANGe][:LIST]:DETector[1]|2 [:FUNCtion]
OFF|NORMal|AVERage|POSitive|SAMPle|NEGative|QPEak|EAVerage
|EPOSitive|MPositive
```

```
[:SENSe]:SPURious[:RANGe][:LIST]:DET2?
```

Example: `SPUR:DET2 EAV`

Normal

Displays the peak-detected level in the interval (bucket) being displayed when the signal is CW-like. If the signal is noise-like (within a bucket the signal both rose and fell), the even bucket shows the peak (maximum) within a two-bucket interval, and the odd bucket shows the negative peak (minimum). Gain is increased to compensate for the effects of faster sweep rates, to keep the displayed value of CW signals accurate.

When Normal is selected, Norm appears on the left side of the display.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

Average

For each interval (bucket) in the trace, Average detection displays the average of all samples within the interval using one of the following averaging methods:

log (also known as video)

power (also known as RMS)

voltage envelope

To explicitly set the averaging method, use the BW/Avg, Avg/VBW Type key. The combination of the average detector and the power method is equivalent to what is sometimes referred to as "RMS detection." When the method (Avg/VBW Type) is set to Pwr Avg, and Detector is set to Average, the RMS method is selected.

When Average is selected, Avg appears on the left side of the display.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

Peak

For each interval (bucket) in the trace, Peak detection displays the highest amplitude within the interval. Peak detection is used for CW measurements and some pulsed-RF measurements. For swept analysis, peak detection basically obtains the maximum video signal between the end of the last bucket and the start of the next one. Gain is increased to compensate for the effects of faster sweep rates, to keep the displayed value accurate. For FFT analysis, the highest spectral amplitude is displayed, even if that peak amplitude falls between samples of the spectrum computed in the FFT process.

When Peak is selected, Peak appears on the left side of the display.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

Sample

The sample detector displays the instantaneous level of the signal at the center of the interval (bucket) represented by each trace point.

Sample detection is primarily used to display noise or noise-like signals.

Sample detection is not best for amplitude measurements of CW-like signals for two reasons. First, the peak response to a signal can occur between samples, so unless the Span to RBW ratio is lower than usual, the highest sample can be well below the peak signal amplitude. Second, for the high sweep rates normally used, the peak response of the RBW filters is up to –0.5 dB. This sweeping error is compensated when using the peak and normal detectors by changing the overall gain. But the gain is not changed when in the sample detector, because to do so would cause errors in the response to noise.

When Sample is selected, `Samp` appears on the left side of the display.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

Negative Peak

For each interval (bucket) in the trace, Negative Peak detection displays the lowest sample within the interval.

When Negative Peak is selected, `NPk` appears on the left side of the display.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

Quasi Peak

Selects quasi peak detection. This is a fast-rise, slow-fall detector used in making CISPR compliant EMI measurements. Quasi peak detection displays a weighted amplitude using specific charge, discharge, and meter-movement time constants as described in CISPR Publication 16.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

EMI Average

Selects EMI averaging detection. EMI Average detection displays the average value of amplitude envelope. It is defined for EMI measurements by the CISPR standard and uses the VBW filter as a low pass filter, the output of which is sampled during the bucket interval. This functionality is quite different from the Average detector.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" **on page 371**.

EMI Peak

Selects peak detection using EMI specifications.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

MIL Peak

Selects peak detection using the MIL specifications.

Key Path: Meas Setup, Range Table, Detector 1 or Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

Off

Detector 2 is off, there is no second trace.

Key Path: Meas Setup, Range Table, Detector 2

State Saved: Saved in Instrument State.

Remote Command: See "Detector 2" on page 371.

Points

Used to set the points mode of the N8201A. Setting to Man allows you to determine the setting, or by selecting Auto the N8201A will determine the number of trace points to ensure the bucket resolution equals RBW/2.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Auto, the value is determined by the radio standard and the instrument model.

Range: 101 to 8192

Remote Command:

```
[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts <number of
points>

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts?

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts:AUTO
1|0|ON|OFF

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts:AUTO?
```

Meas Type

Specifies the measurement type (Examine or Full). This parameter is coupled to the average mode. If you select Examine, the measurement sets Avg Mode to Exp. If you select Full, the measurement sets Avg Mode to Rep. The behavior of each measurement type is described below.

	Single		Continuous	
	No Spurs	**Spurs**	**No Spurs**	**Spurs**
Examine	All active ranges are measured.	All active ranges are measured and the found spurs are reported.	All active ranges are measured.	All active ranges are measured and the found spurs are reported.
	Upon completion, the measurement is set to the idle state.	Upon completion, the measurement is set to the idle state.	Upon completion, the N8201A remains set to the last range checked with an active trace.	Upon completion the N8201A is set to the range containing the worst spur found and continually sweeps this range.
	The message `No Spurs` is displayed.	The trace containing the worst spur is restored.	The message `No Spurs` is displayed.	
		Spur is enabled (no longer grayed out).		**Spur** is enabled (no longer grayed out).
		A marker is added, set to the frequency of the worst spur.		A marker added, set to the frequency of the worst spur.
Full	All active ranges are measured.	All active ranges are measured and the found spurs are reported.	Measurement continually cycles through all active ranges.	All active ranges are measured and the found spurs are reported.
	Upon completion, the measurement is set to the idle state.	Upon completion, the measurement is set to the idle state.		On each cycle of the active ranges, the report on spurs found is reset. This ensures that remote queries retrieve the trace data that matches the currently displayed results.
	The message `No Spurs` is displayed.	The trace of the last active range is displayed.		

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Examine

Range: Examine|Full

Remote Command:

```
[:SENSe]:SPURious:TYPE EXAMine|FULL
[:SENSe]:SPURious:TYPE?
```

Example: `SPUR:TYPE FULL`

Spur

Enables you to view any spurs that have been found. The measurement sets the N8201A to the range in which the currently selected spur was found. The range settings changes only if the selected spur is in the range that is different from the current range settings. A marker identifies the currently selected spur on the trace.

This key is enabled only when Meas Type is set to Examine, and only upon completion of a measurement.

Key Path: Meas Setup

Saved State: No values are saved to state.

Factory Preset: 1

Range: 1 to 200, 10 per range

Remote Command:

```
[:SENSe]:SPURious:SPUR <integer>
[:SENSe]:SPURious:SPUR?
```

Ref Level

Sets the reference level of the N8201A.

Key Path: Meas Setup

Saved State: Ref Level state is saved to Instrument State. Ref Level value is recalculated for each active range the value is not stored in Instrument State.

Factory Preset: 0.00 dBm

Range: –180 dBm to 20 dBm, without reference level offset

Remote Command:

```
[:SENSe]:SPURious:POWer[:RF]:LEVel <integer>
[:SENSe]:SPURious:POWer[:RF]:LEVel?
[:SENSe]:SPURious:POWer[:RF]:RANGe:AUTO OFF|ON|0|1
[:SENSe]:SPURious:POWer[:RF]:RANGe:AUTO?
```

Example:

```
SPUR:POW:RF:LEV 10
SPUR:POW:RF:RANG:AUTO ON
```

Fast Spurious Meas

Turns the fast spurious measurement test on or off. Pressing Fast Spurious Meas to On provides a faster method of execution as with fast spurious testing spurs above the limit line are reported. Any spurs reported outside the limit will cause the measurement to fail. See "Abs Start Limit" on page 367 for more information.

Key Path: Meas Setup

Saved State: Ref Level state is saved to Instrument State. Ref Level value is recalculated for each active range the value is not stored in Instrument State.

Factory Preset: Off

Range: Off|On

Remote Command:

```
[:SENSe]:SPURious:FSMeas OFF|ON|0|1
```

```
[:SENSe]:SPURious:FSMeas?
```

Example:

```
SPUR:FSM ON
```

Meas Setup (Spectrum Emissions Mask—SEM)

When the spectrum emissions mask measurement has been selected in the Measure menu of the Spectrum Analysis Mode, this key displays the appropriate measurement setup menu.

Spectrum Emissions Mask (SEM) measurement includes the in-band and out-of-band spurious emissions. As it applies to W-CDMA (3GPP), this is the power contained in a specified frequency bandwidth at certain offsets relative to the total carrier power. It may also be expressed as a ratio of power spectral densities between the carrier and the specified offset frequency band.

Key Path: Front-panel key

Avg Number

Press Avg Number (On) to specify the number of measurement averages used when calculating the measurement result. The average will be displayed at the end of each sweep.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 10 averages / Off

Range: 1 through 1000

Remote Command:

```
[:SENSe]:SEMask:AVERage:COUNt <integer>
[:SENSe]:SEMask:AVERage:COUNt?
[:SENSe]:SEMask:AVERage[:STATe] OFF|ON|0|1
[:SENSe]:SEMask:AVERage[:STATe]?
```

Example:

```
SEM:AVER:COUN 15
SEM:AVER 1
```

Meas Type

Displays a menu where you can select a measurement reference type, Total Pwr Ref or PSD Ref.

Key Path: Meas Setup

Factory Preset: Total Pwr Ref

Remote Command:

```
[:SENSE]:SEMask:TYPE TPRef | PSDRef
[:SENSE]:SEMask:TYPE?
```

Example:

```
SEM:TYPE TPRef or SEM:TYPE PSDRef
SEM:TYPE?
```

Total Pwr Ref

When Total Pwr Ref is selected, the power in the carrier is used as the reference in computing the relative power values for the offsets.

Key Path: Meas Setup, Meas Type

PSD Ref

When PSD Ref is selected, the mean power spectral density of the carrier is used in computing the relative power spectral density values for the offsets.

Key Path: Meas Setup, Meas Type

Factory Preset: On (Auto)

Ref Channel

Accesses the menu of keys that enable you to change the reference channel settings.

Key Path: Meas Setup

Chan Integ BW

Specifies the integration bandwidth used in calculating the power in the main channel.

Key Path: Meas Setup, Ref Channel

Factory Preset: 3.84 MHz

Range: 10% to 100% of the setting of Chan Span

Remote Command:

```
[:SENSe]:SEMask:BANDwidth[n]|BWIDth[n]:INTegration <number>
[:SENSe]:SEMask:BANDwidth[n]|BWIDth[n]:INTegration?
```

Example:

```
SEM:BWID:INT 4 MHz
SEM:BAND:INT?
SEM:BWID[n]:INT?
```

Chan Span

Specifies the span used in measuring the power in the main channel.

Key Path: Meas Setup, Ref Channel

Factory Preset: 5 MHz

Range: 1 kHz to 10 MHz

Remote Command:

```
[:SENSe]:SEMask:FREQuency:SPAN <number>
[:SENSe]:SEMask:FREQuency:SPAN?
```

Example:

```
SEM:FREQ:SPAN 4 MHz
```

```
SEM:FREQ:SPAN?
```

Sweep Time

Specifies the sweep time used in measuring the power in the main channel.

Key Path: Meas Setup, Ref Channel

Factory Preset: Auto/On

Range: 1 ms through 42 ks

Remote Command:

```
[:SENSe]:SEMask:SWEeptime <number>

[:SENSe]:SEMask:SWEeptime?

[:SENSe]:SEMask:SWEeptime:AUTO OFF|ON|0|1

[:SENSe]:SEMask:SWEeptime:AUTO?
```

Example:

```
SEM:SWE 4 s

SEM:SWE?

SEM:SWE:AUTO 1

SEM:SWE:AUTO?
```

Res BW

Specifies the resolution bandwidth used in measuring and the power in the main channel.

Key Path: Meas Setup, Ref Channel

Factory Preset: 100 kHz/On

Range: Full Range provided by Base Instrument Hardware.

Remote Command:

```
[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution] <freq>

[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution]?

[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution]:AUTO
OFF|ON|0|1

[:SENSe]:SEMask:BANDwidth|BWIDth[:RESolution]:AUTO?
```

Example:

```
SEM:BAND 4 MHz

SEM:BWID 4 MHz

SEM:BAND?

SEM:BWID?

SEM:BAND:AUTO 1

SEM:BWID:AUTO 1

SEM:BAND:AUTO?

SEM:BWID:AUTO?
```

Total Pwr Ref or PSD Ref

Displays the type of power measurement reference selected using the Meas Type key (see "Meas Type" on page 383).

Total Pwr Ref is the power in the carrier that is used as the reference in computing the relative power values for the offsets. When Man is selected, this can be set by the user. When Auto is selected, this is the measured power in the reference carrier.

PSD Ref is the mean power spectral density in the carrier that is used as the reference in computing the relative power spectral density values for the offsets. When Man is selected, this can be set by the user, when Auto is selected, this is the measured mean power spectral density in the reference carrier.

Key Path: Meas Setup, Ref Channel

Factory Preset: 0.00 dBm/Off

Range: –200.0 dBm to 200.0 dBm

Remote Command:

```
[:SENSe]:SEMask:CARRier[:POWer] <ampl>

[:SENSe]:SEMask:CARRier[:POWer]?

[:SENSe]:SEMask:CARRier:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:SEMask:CARRier:AUTO[:STATe]?
```

Example:

```
SEM:CARR 0 dBm

SEM:CARR?
```

```
SEM:CARR:AUTO 1

SEM:CARR:AUTO?
```

Offset/Limits

Displays the menus where you can change the parameters for offset frequency settings and pass/fail tests. Refer to the tables below for default settings of particular radio standards of interest.

Table 8 Offsets & Limits Defaulted for W-CDMA (3GPP) Base Station Measurements

Offset	Start Freq (MHz)	Stop Freq (MHz)	Sweep Time (μs)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Rel Couple	Fail Mask	Meas BW
A, On	2.515	2.715	Auto	30.0	– 14.0	– 14.0	Couple	– 30.0	– 30.0	Couple	Abs	1
B, On	2.715	3.515	Auto	30.0	– 14.0	– 26.0	Man	– 30.0	– 30.0	Couple	Abs	1
C, On	3.515	4.000	Auto	30.0	– 26.0	– 26.0	Couple	– 30.0	– 30.0	Couple	Abs	1
D, On	4.000	8.000	Auto	1000.0 30.0	– 13.0	– 13.0	Couple	– 30.0	– 30.0	Couple	Abs	1 33
E, On	8.000	12.500	Auto	1000.0	– 13.0	– 13.0	Couple	– 30.0	– 30.0	Couple	Abs	1
F, Off	12.500	15.000	Auto	1000.0	– 13.0	– 13.0	Couple	– 30.0	– 30.0	Couple	Abs	1 33

Table 9 Offsets & Limits Defaulted for W-CDMA (3GPP) Mobile Station Measurements

Offset	Start Freq (MHz)	Stop Freq (MHz)	Sweep Time (μs)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Rel Couple
A, On	2.515	3.485	Auto	30.0	– 71.07	– 71.07	Couple	– 35.23	– 49.78	Man
B, On	4.000	7.500	Auto	1000.0	– 55.84	– 55.84	Couple	– 35.50	– 39.00	Man
C, On	7.500	8.500	Auto	1000.0	– 55.84	– 55.84	Couple	– 39.00	– 49.00	Man
D, On	8.500	12.000	Auto	1000.0	– 55.84	– 55.84	Couple	– 49.00	– 49.00	Couple
E, Off	12.500	15.000	Auto	1000.0	– 55.84	– 55.84	Couple	– 49.00	– 49.00	Couple
F, Off	12.500	15.000	Auto	1000.0	– 55.84	– 55.84	Couple	– 49.00	– 49.00	Couple

Table 10 Offsets & Limits Defaulted for 802.11a, 802.11g, and HiperLAN/2 Radio Standards

Offset	Start Freq (MHz)	Stop Freq (MHz)	Sweep Time (ms)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Rel Couple	Fail Mask	Meas BW
A, On	9.0	11.0	100	100	16.0	– 4.0	Man	0.0	– 20.0	Man	Rel	1
B, On	11.0	20.0	100	100	– 4.0	– 12.0	Man	– 20.0	– 28.0	Man	Rel	1

Table 10 Offsets & Limits Defaulted for 802.11a, 802.11g, and HiperLAN/2 Radio Standards

Offset	Start Freq (MHz)	Stop Freq (MHz)	Sweep Time (ms)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Rel Couple	Fail Mask	Meas BW
C, On	20.0	30.0	100	100	– 12.0	– 24.0	Man	- 28.0	– 40.0	Man	Rel	1
D, On	30.0	50.0	100	100	– 24.0	– 24.0	Couple	– 40.0	– 40.0	Couple	Rel	1
E, Off	50.0	100.0	100	100	– 24.0	– 24.0	Couple	– 40.0	– 40.0	Couple	Rel	1
F, Off	216.0	250.0	100	100	– 24.0	– 24.0	Couple	– 47.0	– 47.0	Couple	Rel	1

Table 11 Offsets & Limits Defaulted for 802.11b

Offset	Start Freq (MHz)	Stop Freq (MHz)	Sweep Time (ms)	Res BW (kHz)	Abs Start (dBm)	Abs Stop (dBm)	Abs Couple	Rel Start (dBc)	Rel Stop (dBc)	Rel Couple	Fail Mask
A, On	11.0	22.0	100	100	– 10.0	– 10.0	Couple	– 30.0	– 30.0	Couple	Rel
B, On	22.0	50.0	100	100	– 30.0	– 30.0	Couple	– 50.0	– 50.0	Couple	Rel
C, On	50.0	70.0	100	100	– 30.0	– 30.0	Couple	- 50.0	– 50.0	Couple	Rel
D, On	70.0	90.0	100	100	– 30.0	– 30.0	Couple	– 50.0	– 50.0	Couple	Rel
E, Off	90.0	100.0	100	100	– 30.0	– 30.0	Couple	– 50.0	– 50.0	Couple	Rel
F, Off	100.0	120.0	100	100	– 30.0	– 30.0	Couple	– 50.0	– 50.0	Couple	Rel

Offset

Selects the offset pairs (upper and lower) that the menu keys affect, and displays the memory selection menu from A to F for (where you can store up to 6 sets of values for Start Freq, Stop Freq, Sweep Time, Res BW, Meas BW, Abs Start, Abs Stop, and so forth). Press Offset until the letter of the desired offset (A, B, C, D, E, or F) is underlined. Only one selection at a time is shown on this key label. Since the display can show only five results at one time, the Results Index key allows you to scroll to the sixth result when all offsets are active.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: A

Remote Command: There is no remote command for this function.

Start Freq

Specifies the inner limit (frequency closest to the carrier) for both segments of the specified offset pair. When Start Freq (Off) is selected, the offset pair is not measured.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: Hz

Range: 0 Hz to 500 MHz

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STARt <freq>, ...
[<freq>] (up to five values)

[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STARt?

[:SENSe]:SEMask:OFFSet[n]:LIST:STATe OFF|ON|0|

[:SENSe]:SEMask:OFFSet[n]:LIST:STATe?
```

Remote Command Notes:

Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Offsets that are turned off, for the currently selected offset will return a

– 999.0 when queried.

Example:

```
SEM:OFFS:LIST:FREQ:STAR 2 MHz

SEM:OFFS:LIST:FREQ:STAR?

SEM:OFFS:LIST:STAT 1

SEM:OFFS:LIST:STAT?
```

Stop Freq

Specifies the outer limit (frequency furthest from the carrier) for both segments of the specified offset pair. The lower range is limited to the setting of Start Freq.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: Hz

Range: 0 Hz to 500 MHz

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STOP <freq> ...
[<freq>] (up to five values)
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:FREQuency:STOP?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:FREQ:STOP 4 MHz
```

```
SEM:OFFS:LIST:FREQ:STOP?
```

Sweep Time

Specifies the sweep time for the currently selected offset, and toggles this function between Auto and Manual for each offset.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: s (seconds)

Range: 1 ms to 42 ks

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime <time> ...
[<time>] (up to five values)
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime?
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime:AUTO OFF|ON|0|1
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:SWEeptime:AUTO?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:SWE:AUTO 4 ms

SEM:OFFS:LIST:SWE:AUTO?

SEM:OFFS:LIST:SWE 4 ms

SEM:OFFS:LIST:SWE?
```

Res BW

Specifies the resolution bandwidth used in measuring the offset pair. When set to Auto, the Res BW from the default tables for "Offset/Limits" on page 388 are used. When set to Man, the range of settings is the range of available Res BWs of the N8201A, except the maximum is further limited to not exceed (Stop Freq - Start Freq).

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: Hz

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth
[:RESolution] <freq>...[<freq>] (up to five values)

[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth
[:RESolution]?

[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth
[:RESolution]:AUTO OFF|ON|0|1

[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth
[:RESolution]:AUTO?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:BAND 40 kHz or SEM:OFFS:LIST:BWID 40 kHz

SEM:OFFS:LIST:BAND? or SEM:OFFS:LIST:BWID?

SEM:OFFS:LIST:BAND:AUTO 0 or SEM:OFFS:LIST:BWID:AUTO 0

SEM:OFFS:LIST:BAND:AUTO? or SEM:OFFS:LIST:BWID:AUTO?
```

Meas BW

Enables you to specify the bandwidth to use when measuring the offset. When using the front panel, only the currently selected offset is affected. All the offsets are affected when using the remote command. This is the multiplier applied to the resolution bandwidth to determine the bandwidth to integrate when calculating the power.

Key Path: Meas Setup, Offset/Limits

Key Notes:

The 3GPP standard allows for the construction of an effective measurement bandwidth out of a group of narrower resolution bandwidths. This allowance is a remedy for the potential loss in dynamic range which can occur when carrier energy leaks into the offset due to the RBW filter's shape factor (nominally 12:1). When the offset's ratio of start frequency to the Meas BW is small (approximately 4:1), it is recommended that you select a small Res BW value (30 kHz) and a large multiplier (Meas BW=33) in order to increase the dynamic range of the measurement. Refer to offset D in Table 8 on page 388.

When setting Meas BW > 1, dynamic range is increased, however measurement time is also increased since an increased number of sweep points are required to make the measurement. For Meas BW > 1, consider this equation for trace points:

Trace points = (Offset Stop Freq - Offset Start Freq)/ (Meas BW/100)

When Meas BW = 1, the number of trace points are set at the value specified upon entering the measurement.

Dependencies/Couplings: This parameter must adhere to the rule: (N x Res BW) £ (Stop Freq of the offset - Start freq of the offset), where N is Meas BW value. If the Res BW is changed, Meas BW will change to ensure this rule.

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: x Res BW

Range: 1 to 1000

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth:IMULti
<integer>
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth:IMULti?
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth
[:RESolution]:AUTO OFF|ON|0|1
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:BANDwidth|BWIDth
[:RESolution]:AUTO?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:BAND:IMUL 40 or SEM:OFFS:LIST:BWID:IMUL 40
```

```
SEM:OFFS:LIST:BAND:IMUL? or SEM:OFFS:LIST:BWID:IMUL?
```

```
SEM:OFFS:LIST:BAND:AUTO 0 or SEM:OFFS:LIST:BWID:AUTO 0
```

```
SEM:OFFS:LIST:BAND:AUTO? or SEM:OFFS:LIST:BWID:AUTO?
```

Abs Start

Enables you to enter an absolute level limit at Start Freq for the currently selected offset ranging from -200.00 to +50.00 dBm with 0.01 dB resolution.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: dBm

Range: –200 dBm to 50 dBm

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:ABSolute
<ampl>,...[<ampl>] (up to five values)
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:ABSolute?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:STAR:ABS -20 dBm
```

```
SEM:OFFS:LIST:STAR:ABS
```

Abs Stop

Enables you to enter an absolute level limit at Stop Freq for the currently selected offset ranging from -200.00 to +50.00 dBm with 0.01 dB resolution, and to toggle this function between Couple and Man. If set to Couple, this is coupled to Abs Start to make a flat limit line. If set to Man, Abs Start and Abs Stop you can enter different values to make a sloped limit line.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: dBm

Range: –200 dBm to 50 dBm

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute
<ampl>,...[<ampl>] (up to five values)
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute?
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute:COUPle
OFF|ON|0|1
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:ABSolute:COUPle?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:STOP:ABS -20 dBm
```

```
SEM:OFFS:LIST:STOP:ABS
```

```
SEM:OFFS:LIST:STOP:ABS:COUP 0

SEM:OFFS:LIST:STOP:ABS:COUP?
```

Rel Start

Enables you to enter a relative level limit at Start Freq ranging from –150.00 to +50.00 dBc with 0.01 dB resolution.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: dBc

Range: –200 dBc to 50 dBc

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:RCARrier
<rel_ampl>,... [<rel_ampl>] (up to five values)

[:SENSe]:SEMask:OFFSet[n]:LIST:STARt:RCARrier?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:STAR:RCAR –20 dBc

SEM:OFFS:LIST:STAR:RCAR?
```

Rel Stop

Enables you to enter a relative level limit at Stop Freq ranging from -150.00 to +50.00 dBc with 0.01 dB resolution, and to toggle this function between Couple and Man. If set to Couple, this is coupled to Rel Start to make a flat limit line. If set to Man, Rel Start and Rel Stop you can enter different values to make a sloped limit line.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Default Terminator: dBc

Range: –200 dBc to 50 dBc

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier
<real number>,[<real number>]...
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier?
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier:COUPle
OFF|ON|0|1
```

```
[:SENSe]:SEMask:OFFSet[n]:LIST:STOP:RCARrier:COUPle?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:STOP:RCAR –20 dBm
```

```
SEM:OFFS:LIST:STOP:RCAR
```

```
SEM:OFFS:LIST:STOP:RCAR:COUP 0
```

```
SEM:OFFS:LIST:STOP:RCAR:COUP?
```

Fail Mask

Displays the menu to select one of the following logic keys for fail conditions between the measurement results and the test limits: Absolute, Relative, Abs AND Rel, and Abs OR Rel.

- Absolute - Fail is shown if one of the absolute spectrum emission mask measurement results is larger than the limit between Abs Start and Abs Stop, inclusive. This is the default selection for each offset for BTS measurements.
- Relative - Fail is shown if one of the relative spectrum emission mask measurement results is larger than the limit between Rel Start and Rel Stop, inclusive.
- Abs AND Rel - Fail is shown if one of the absolute spectrum emission mask measurement results is larger than the limit between Abs Start and Abs Stop, inclusive AND one of the relative spectrum emission mask measurement results is larger than the limit for Rel Start and Rel Stop. This is the default for MS measurements.

- Abs OR Rel - Fail is shown if one of the absolute spectrum emission mask measurement results is larger than the limit between Abs Start and Abs Stop, inclusive OR one of the relative spectrum emission mask measurement results is larger than the limit for Rel Start and Rel Stop.

Key Path: Meas Setup, Offset/Limits

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Remote Command:

```
[:SENSe]:SEMask:OFFSet[n]:LIST:TEST
ABSolute|AND|OR|RELative

[:SENSe]:SEMask:OFFSet[n]:LIST:TEST?
```

Remote Command Notes: Comma separated list. When offset F is off, this will be 5 values. When offset F is on, this will be 6 values. n = 1 for BTS and n = 2 for MS. Default is BTS.

Example:

```
SEM:OFFS:LIST:TEST ABS,REL,AND,OR

SEM:OFFS:LIST:TEST?
```

Absolute

Set the limit test to show Fail if one of the absolute spectrum emission mask measurement results is larger than the limit for Abs Start and/or Abs Stop. This is the default selection for each offset

Key Path: Meas Setup, Offset/Limits, Fail Mask

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Remote Command: Refer to "Fail Mask" on page 397.

Relative

Sets the limit test to show Fail if one of the relative spectrum emission mask measurement results is larger than the limit for Rel Start and/or Rel Stop.

Key Path: Meas Setup, Offset/Limits, Fail Mask

State Saved: Saved in Instrument State.

Factory Preset:

Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Remote Command: Refer to "Fail Mask" on page 397.

Abs AND Rel

Set the limit test to show Fail if one of the absolute spectrum emission mask measurement results is larger than the limit for Abs Start and Abs Stop AND one of the relative spectrum emission mask measurement results is larger than the limit for Rel Start and Rel Stop.

Key Path: Meas Setup, Offset/Limits, Fail Mask

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Remote Command: Refer to "Fail Mask" on page 397.

Abs OR Rel

Set the limit test to show Fail if one of the absolute spectrum emission mask measurement results is larger than the limit for Abs Start and Abs Stop OR one of the relative spectrum emission mask measurement results is larger than the limit for Rel Start and Rel Stop.

Key Path: Meas Setup, Offset/Limits, Fail Mask

State Saved: Saved in Instrument State.

Factory Preset: Dependent upon Radio Standard and device selected, refer to the default tables for "Offset/Limits" on page 388 for this value.

Remote Command: Refer to "Fail Mask" on page 397.

Results Index

Used to view the sixth result when all offsets are active. Since the display can show only five results at one time, this key allows you to scroll to the last result.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: 1

Range: 1 to 6

Remote Command: `[:SENSe]:SEMask:RESult`

Example: `SENS:SEM:RES`

Optimize Ref Level

Sets the input attenuator and reference level to optimize the robustness of the measurement, which is its freedom from errors due to input compression and log amp range limitations.

There is always a minimum of 2 dB of attenuation set to protect the N8201A input.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example: POW:RANG:AUTO ONCE

RRC Filter

Pressing RRC Filter turns the Root Raised Cosine filter on or off. This filter is the type specified in the 3GPP W-CDMA standards. This parameter is only available when 3GPP W-CDMA is selected as the Radio Std from the Mode Setup menu. If 3GPP W-CDMA is selected, the rolloff value (alpha) for the filter will be initially set to 0.22 and T will be 260 ns. The rolloff value can be changed using Filter Alpha.

Key Path: Meas Setup

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
[:SENSe]:SEMask:FILTer[:RRC][:STATe] OFF|ON|0|1
```

```
[:SENSe]:SEMask:FILTer[:RRC][:STATe]?
```

Example:

```
SEM:FILT 1
```

```
SEM:FILT?
```

Filter Alpha

Inputs the alpha value for the RRC Filter. This parameter is only available when 3GPP W-CDMA is selected as the Radio Std. from the Mode Setup menu.

16 MODE

Selects the measurement mode of your analyzer. Spectrum Analysis mode is for general purpose measurement use. The instrument comes with the Spectrum Analysis mode. Additional measurement modes can be added to your instrument memory. Refer to the individual measurement personality mode manuals for instructions on how to install the software.

Dependencies/Couplings: Other modes, besides Spectrum Analysis, must be installed/licensed in your instrument before they appear in the **Mode** menu. Some modes also require the presence of specific hardware.

Saved State: Saved in Instrument State.

Factory Preset: Spectrum Analysis

If **Preset Type Mode** is selected, then the analyzer settings are preset but it stays in that selected mode.

Remote Command:

```
:INSTrument[:SELect] BASIC|NFIGURE|PNOISE|SA
```

```
:INSTrument[:SELect]?
```

Remote Command Notes:

Select the measurement mode. The actual available choices depend upon which modes (measurement applications) are installed in the instrument.A list of the valid choices is returned with the INST:CAT? query.

Once an instrument mode is selected, only the commands that are valid for that mode can be executed.

BASIC

NFIGURE (noise figure)

PNOISE (phase noise)

SA

Example:

```
INST SA

INST?
```

Spectrum Analysis

Selects the spectrum analysis measurement mode for your analyzer.

Key Path: Mode

Remote Command:

```
:INSTrument[:SELect] SA
```

Example:

```
INST SA
INST?
```

Application Mode Number Selection (Remote command only)

Select the measurement mode by its mode number. The actual available choices depend upon which applications are installed in your instrument.

Dependencies/Couplings: Other modes, besides Spectrum Analysis, must be installed/licensed in your instrument before they appear in the **Mode** menu. Some modes also require the presence of specific hardware.

Factory Preset: 1 (Spectrum Analysis)

If **Preset Type Mode** is selected, then the analyzer settings are preset but it stays in that selected mode.

Remote Command:

```
:INSTrument:NSELect <integer>
```

```
:INSTrument:NSELect?
```

Remote Command Notes:

Enter one of the following integers in the command to set the analyzer mode.

Mode	NSELect Number	Mode Keyword
Basic	8	BASIC
Noise Figure	219	NFIGURE
Phase Noise	14	PNOISE
Spectrum Analysis	1	SA

Example:

```
INST:NSEL 4
```

Application Mode Catalog Query (Remote command only)

Returns a comma separated list of strings that contain the names of all the installed applications/modes. These names can only be used with the **INST:SELECT** command.

Remote Command:

```
:INSTrument:CATalog?
```

Example:

```
INST:CAT?
```

Query response: `"SA","CDMA","PNOISE"`

17
Mode Setup (Spectrum Analysis Mode)

Enables you to change measurement settings common to *all* measurements in the **MEASURE** menu. In Spectrum Analysis mode, there are several built-in power measurements. Parameters that you set in the Mode Setup menu affect all of these measurements.

Key Path: Front-panel key

Radio Std

Accesses the available radio standard. Selecting a radio standard modifies spectrum analyzer settings for the measurements activated under the **MEASURE** menu.

Measurements that are not relevant to the selected radio standard are not available (grayed out) and they do not have instrument default settings associated with them. If **Enable All Measurements** is set to `Yes` when the **Radio Std** is pressed, only the standards that are relevant to the currently active measurement will be available. Unavailable standards will be grayed out.

Key Path: Mode Setup

Factory Preset: None

Remote Command:

```
[:SENSe]:RADio:STANdard[:SELect]
NONE|IS95a|JSTD|IS95C|GSM|W3GPP
|C2000MC1|C2000DS|C2000MC3|NADC|PDC|BLUEtooth|TETRa|WL802D
OT11A
|WL802DOT11B|WL802DOT11G|WL802DOT11N|HIPERLAN2|DVBTDLN
DVBTGPN|DVBTIPN|FCC15|SDMBSE|UWBINDOOR|
```

None

Selects no radio standard. If **Radio Std, None** is selected when a measurement is running, all measurement parameters are returned to their default values. Analyzer parameters outside the **MEASURE** or **Meas Setup** key menus are not affected.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN NONE
```

IS-95A

Sets the specific parameters for the selected measurement (located under the “Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard IS-95A. The Spectrum Emissions Mask, Harmonic Distortion, and Spurious Emissions measurements are not available when this radio standard is selected.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN IS95
```

J-STD-008

Sets the specific parameters for the selected measurement (located under the “Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard J-STD-008. The Spectrum Emissions Mask, Harmonic Distortion, MCP, and Spurious Emissions measurements are not available when this radio standard is selected.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN JSTD
```

IS-95C

Sets the specific parameters for the selected measurement (located under the “Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard IS-95C. The IS-95C radio standard is only available when selecting the Channel Power, Occupied Bandwidth, Adjacent Channel Power, and CCDF one-button measurements.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN IS95C
```

GSM/EDGE

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard GSM/EDGE. Power Stat CCDF and Burst Power are the only measurements available for this standard.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example:

```
RAD:STAN GSM
```

3GPP W-CDMA

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard W-CDMA. All measurements except Harmonic Distortion and Spurious Emissions are available for this standard.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example:

```
RAD:STAN W3GPP
```

cdma2000 MC-1X

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard cdma2000-MC-1X. All measurements except Harmonic Distortion, Spurious Emissions, and Spectrum Emission Mask are available for this standard.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN C2000MC1
```

cdma2000 MC-3X

Sets the specific parameters for the selected measurement (located under the “Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard cdma2000:MC-3X. All measurements except Multi-Carrier Power, Harmonic Distortion, Spurious Emissions and Spectrum Emission Mask are available for this standard.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN C2000MC3
```

cdma2000 DS

Sets the specific parameters for the selected measurement (located under the “Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard cdma2000:DS. All measurements except Multi-Carrier Power, Harmonic Distortion, Spurious Emissions and Spectrum Emission Mask are available for this standard.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN C2000DS
```

NADC

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard NADC. Channel Power and Intermod TOI measurements are not available when **Device (MS)** is selected. All other measurements are available when this radio standard is selected except: Spectrum Emissions Mask, Harmonic Distortion, Spurious Emissions, and Multi-Carrier Power.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example:

```
RAD:STAN NADC
```

PDC

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard PDC. The Burst Power measurement is not available when **Device (BTS)** is selected. The Channel Power and Intermod TOI measurements are not available when **Device (MS)** is selected. All other measurements except Multi-Carrier Power, Harmonic Distortion, Spurious Emissions and Spectrum Emission Mask measurements are available for this standard.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example:

```
RAD:STAN PDC
```

Bluetooth™

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard Bluetooth™. Power Stat CCDF and Burst Power are the only measurements available for this standard.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example:

```
RAD:STAN BLUE
```

TETRA

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard TETRA. This standard is only available for the Channel Power and ACP measurements.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example:

```
RAD:STAN TETR
```

FCC Part 15 Subpart F

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for unlicensed devices. This standard is only available for the Spurious Emissions measurement.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command:

Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example:

```
RAD:STAN FCC15
```

WLAN

Accesses the WLAN radio standards key menu to enable you to select a WLAN standard. Selecting a radio standard modifies spectrum analyzer settings for the SEM measurement activated under the **MEASURE** menu.

802.11a

Sets the specific parameters for the selected measurement (located under the “Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard 802.11a. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std, W-LAN

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example: `RAD:STAN WL802DOT11A`

802.11b

Sets the specific parameters for the selected measurement (located under the “Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard 802.11b. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std, W-LAN

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example: `RAD:STAN WL802DOT11B`

802.11g

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard 802.11g. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std, W-LAN

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example: `RAD:STAN WL802DOT11G`

802.11n

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233key description) appropriate for industry standard 802.11n. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std, W-LAN

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example: `RAD:STAN WL802DOT11N`

Hiper LAN/2

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard Hiper LAN2. This standard is only available for the Spectrum Emission Mask (SEM) measurement.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std, W-LAN

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example: `RAD:STAN HIPERLAN2`

DVB-T

Accesses the DVB-T key menu to enable you to select a DVB-T mask filtering standard. Selecting a DVB-T filtering standard modifies spectrum analyzer settings for the CHP or CCDF measurement activated under the **MEASURE** menu.

L/SECAM/NICAM

Pressing **L/SECAM/NICAM** selects the filtering masks for the L/SECAM/NICAM analog television system. This standard is only available for the channel power and CCDF measurements

Key Path: Mode Setup, DVB-T

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example: `RAD:STAN DVBTLSN`

G/PAL/NICAM

Pressing **G/PAL/NICAM** selects the filtering masks for the G/PAL/NICAM analog television system. This standard is only available for the channel power and CCDF measurements.

Key Path: Mode Setup, DVB-T

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example: `RAD:STAN DVBTGPN`

I/PAL/NICAM

Pressing **I/PAL/NICAM** selects the filtering masks for the I/PAL/NICAM analog television system. This standard is only available for the channel power and CCDF measurements.

Key Path: Mode Setup, DVB-T

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example: `RAD:STAN DVBTIPN`

S-DMB

Accesses the S-DMB radio standards key menu to enable you to select a S-DMB standard. Selecting a radio standard modifies spectrum analyzer settings for the Spurious Emissions measurement activated under the **MEASURE** menu. This standard is only available for the Channel Power, Occupied BW, and ACP measurements

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

System E

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for industry standard System E. This standard is only available for the Channel Power, Occupied BW, or ACP measurements.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See "Radio Std" on page 412.

Example: `RAD:STAN DVBTGPN`

UWB

Accesses the UWB radio standards key menu to enable you to select a UWB standard. Selecting a radio standard modifies spectrum analyzer settings for the Spurious Emissions measurement activated under the **MEASURE** menu.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

UWB Indoor

Sets the specific parameters for the selected measurement (located under the "Measure (Spectrum Analysis Mode)" on page 233 key description) appropriate for UWB Indoor standard. This standard is only available for the Spurious Emissions measurement.

Key Type: 1 of N menu

Key Path: Mode Setup, Radio Std

Remote Command: Use `[:SENSe]:RADio:STANdard[:SELect]` See “Radio Std” on page 412.

Example: `RAD:STAN UWBINDOOR`

Radio Std Setup

Accesses the key menu for selecting the device, packet type, or signal bandwidth to be measured.

Key Path: Mode Setup

Remote Command:

There is no equivalent remote command.

Signal BW

Allows you to set the measurement bandwidth when **Radio Std (None)** is selected. This function is available only when you select None as the standard.

Key Path: Mode Setup, Std Setup

Factory Preset: 3.0 MHz

Default Terminator: Hz

Range: The non-zero span range of the analyzer

Remote Command:

```
[:SENSe]:RADio:STANdard:SBWidth <freq>
[:SENSe]:RADio:STANdard:SBWidth?
```

Example:

```
RAD:STAN:SBW 2MHZ
```

Retain Params

Enables you to retain the base-instrument parameter settings used by individual measurements that are typically lost when switching between measurements.

When **Retain Params** is set to **Off**, the values of the fully configurable parameters are not saved and recalled during a measurement change.

When **Retain Params** is set to **On**, the fully configurable parameters will be saved and recalled during a measurement change, along with **Span**, **Ref Level**, **Single/Cont**, **Detector**, **Avg/VBW Type**, **Points**, and if applicable, **Spectrum/Bar/Combined** and **Graticule On/Off**.

NOTE

When **Radio Std** or **Radio Std Setup** is changed, **Retain Params** is set to **Off**. Once **Retain Params** has been set to **Off**, parameters will no longer be retained and any settings you may have entered will be lost.

Key Path: Mode Setup

Factory Preset: Off

Remote Command:

```
[:SENSe]:RADio:STANdard:RPARams[:STATe]ON|Off|1|0
```

```
[:SENSe]:RADio:STANdard:RPARams[:STATe]?
```

Example:

```
RAD:STAN:RPAR Off
```

Enable All Measurements

Enable All Measurements allows you to access measurements that are disabled. Not all measurements are available for a particular radio standard. When you select a radio standard, the keys are grayed out for the measurements that are not available. These disabled measurements do not have default settings for the standard that you have selected. So you have to configure the settings yourself when you use them. See also the **Retain Params** key function.

If you set **Enable All Measurements** to `Yes` and you enter one of the measurements that was disabled, then the **Enable All Measurements** function will not be available (grayed out). You cannot turn it off until you enter a measurement that is valid for your selected standard.

Key Path: Mode Setup

Factory Preset: No

Remote Command:

```
[:SENSe]:RADio:STANdard:EAMeas YES|NO
```

```
[:SENSe]:RADio:STANdard:EAMeas?
```

Example:

```
RAD:STAN:EAM YES
```

Autorange of Power Setting (Remote command only)

This command is the remote version of the **Optimize Ref Level** key. If this function is applicable to the currently selected measurement, this command sets the reference level and attenuator to optimum values based on the signal present at the input. Channel Power, Occupied Bandwidth, ACP, Multi Carrier Power, CCDF, Harmonic Distortion, Burst Power, Intermod (TOI) and SEM measurements are the only supported measurements for the reference level optimization.

Remote Command:

```
[:SENSe]:POWer[:RF]:RANGe:AUTO ONCE
```

Example:

```
POW:RANG:AUTO ONCE
```

Application Mode Number Selection (Remote command only)

Select the measurement mode by its mode number. The actual available choices depend upon which applications are installed in your instrument.

Dependencies/Couplings: Other modes, besides Spectrum Analysis, must be installed/licensed in your instrument before they appear in the **Mode** menu. Some modes also require the presence of specific hardware.

Factory Preset: 1 (Spectrum Analysis)

If **Preset Type Mode** is selected, then the analyzer settings are preset but it stays in that selected mode.

Remote Command:

```
:INSTrument:NSELect <integer>
```

```
:INSTrument:NSELect?
```

Remote Command Notes:

Enter one of the following integers in the command to set the analyzer mode.

Mode	NSELect Number	Mode Keyword
Basic	8	BASIC
Noise Figure	219	NFIGURE
Phase Noise	14	PNOISE
Spectrum Analysis	1	SA

Example:

```
INST:NSEL 14
```

Application Mode Catalog Query (Remote command only)

Returns a comma separated list of strings that contain the names of all the installed applications/modes. These names can only be used with the `INST:SELECT` command.

Remote Command:

```
:INSTrument:CATalog?
```

Example:

```
INST:CAT?
```

Query response: `"SA","CDMA","PNOISE"`

18 Peak Search

Places a marker on the highest peak and displays the search menu. If Peak Search Type (Param) is set to Excursion & Threshold, the peak found must meet the defined peak excursion and threshold values. (See "Search Param" on page 437.) Peaks that are less than 1% of the current span away from 0 Hz are ignored. For example, if Span is 1 MHz, peaks will not be found between –10 kHz and +10 kHz. If no valid peak is found, an error (No Peak Found) is displayed. To clear this message, press ESC before attempting another search.

The peak search parameters are Peak Threshold and Peak Excursion. All searches except Peak Search (Next Peak, Next Left, Next Right, Peak Table, SCPI "PEAKS" command) obey the Search Parameters, which means that only peaks which rise above the Peak Threshold by at least the Peak Excursion are found. Peak Search obeys then when Peak Search is in PARAM mode. When the Peak Search key is in MAX mode, the search parameters are ignored for a Peak Search.

You can go into the Peak Search menu without actually performing a Peak Search by using the front-panel Return key (assuming you have previously accessed the Peak Search menu). Press Return to navigate through the previously accessed menus until you return to the Peak Search menu.

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:MAXimum`

Remote Command Notes: The `:CALC:MARK:PEAK:SEARC:MODE MAX|PAR` command specifies how a peak is identified for use with the marker commands. See "Peak Search" on page 439.

Example:

`CALC:MARK2:MAX` performs a peak search using marker 2.

`CALC:MARK2:Y?` queries the marker amplitude (Y-axis) value for marker 2. For more information on this command, see "Marker" on page 203.

`CALC:MARK2:X?` queries the marker frequency or time (X-axis) value for marker 2. For more information on this command, see "Marker" on page 203.

Next Peak

Places the marker on the next highest peak with an amplitude less than the current peak. The peak must meet the defined peak excursion and threshold values. Peaks that are less than 1% of the current span away from 0 Hz are ignored. If no valid peak is found, an error (`No Peak Found`) is displayed. Press **ESC** to clear this message before attempting another search. (Also see "Peak Excursn" on page 437 and "Pk Threshold" on page 438 descriptions.)

Key Path: Peak Search

State Saved: Not part of saved state.

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:MAXimum:NEXT`

Example:

`CALC:MARK2:MAX:NEXT` selects marker 2 and moves it to the next highest peak.

Next Pk Right

Moves the marker to the next peak to the right of the current marker. The peak must meet the defined peak excursion and threshold limits. Peaks that are less than 1% of the current span away from 0 Hz are ignored. If no valid peak is found, an error "No Peak Found" is displayed. Press **ESC** to clear this message before attempting another search. (Also see "Peak Excursn" on page 437 and "Pk Threshold" on page 438 descriptions.)

Key Path: Peak Search

State Saved: Not part of saved state.

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:MAXimum:RIGHt
```

Example:

CALC:MARK2:MAX:RIGH selects marker 2 and moves it to the next peak to the right.

Next Pk Left

Moves the marker to the next peak to the left of the current marker. The peak must meet the defined peak excursion and threshold limits. Peaks that are less than 1% of the current span away from 0 Hz are ignored. If no valid peak is found, an error "No Peak Found" is displayed. Press **ESC** to clear this message before attempting another search. (Also see "Peak Excursn" on page 437 and "Pk Threshold" on page 438 descriptions.)

Key Path: Peak Search

State Saved: Not part of saved state.

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:MAXimum:LEFT
```

Example:

`CALC:MARK2:MAX:LEFT` selects marker 2 and moves it to the next peak to the left.

Min Search

Moves the active marker to the minimum detected amplitude value on the current trace.

Key Path: Peak Search

State Saved: Not part of saved state.

Remote Command:

:CALCulate:MARKer[1]|2|3|4:MINimum

Example:

CALC:MARK:MIN selects marker 1 and moves it to the minimum amplitude value.

Pk-Pk Search

Finds and displays the amplitude and frequency (or time, if in zero span) differences between the highest and lowest trace points by setting a reference marker on the peak signal and placing a Δ marker on the minimum signal.

Key Path: Peak Search

State Saved: Not part of saved state.

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:PTPeak
```

Example:

```
CALC:MARK:PTP
```

`CALC:MARK:Y?` queries the delta amplitude value for marker 1. For more information on this command, see "Marker" on page 203.

Mkr->CF

See “Mkr->CF" on page 200 for the command to select this function.

Key Path: Peak Search

Continuous Pk

When a marker is placed on a signal and Continuous Pk is pressed, the marker will remain on the signal even if the signal frequency changes, as long as the amplitude of the signal does not change by more than 3 dB from one sweep to another.

If the signal is lost, an attempt will be made to find it again and maintain the marker on the signal peak. If there are other signals on screen near the same amplitude, one of them may be found instead. Signals near 0 Hz cannot be maintained effectively, because they cannot be distinguished from the LO feedthrough, which is excluded by intent from the search algorithm.

This function is intended to maintain the marker on signals with a frequency that is changing, and an amplitude that is not changing.

Key Path: Peak Search

State Saved: Saved in Instrument State.

Factory Preset: Off

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:CPEak[:STATe] OFF|ON|0|1
```

```
:CALCulate:MARKer[1]|2|3|4:CPEak[:STATe]?
```

Remote Command Notes:

This command may not be used to activate a given marker.

Example:

```
CALC:MARK:CPE ON
```

Search Param

Displays the search parameter criteria menu that enables you to adjust the parameters for the peak search functions. These parameters mean that only peaks that rise above the peak threshold by at least the peak excursion, and then drop by at least the peak excursion, are identified as peaks.

Key Path: Peak Search

Remote Command:

There is no remote command for this key.

Peak Excursn

Sets the minimum amplitude variation of signals that the marker can identify as a separate peak. For example, if a peak excursion value of 10 dB is selected, the marker Next Peak function moves only to peaks that rise more than 10 dB above the Peak Threshold and then fall back down by at least the Peak Excursn. This criteria applies to all traces. This function applies to Next Peak, Next Peak Left, and Next Peak Right. If Peak Search is set to Param, it also applies to Peak Search.

Key Path: Peak Search, Search Param

Dependencies/Couplings: This function is not available when Y-Axis is set to Frequency instead of Amplitude.

State Saved: Saved in Instrument State.

Factory Preset: 6.0 dB

Terminators: dB

Resolution/Rounding/Truncation: 0.01 dB

Range: 0.0 dB to 100 dB

Remote Command:

```
:CALCulate:MARKer[1]|2|3|4:PEAK:EXCursion <rel_amplitude>
:CALCulate:MARKer[1]|2|3|4:PEAK:EXCursion?
```

Remote Command Notes:

`CALC:MARK:PEAK:SEAR:MODE` must be set to `PARameter` if you want Peak Search to take advantage of the threshold excursion.

Example:

`:CALC:MARK:PEAK:EXC 30 DB` sets the minimum peak excursion requirement to 30 dB.

See the full example for the `CALC:MARK:PEAK:SEAR:MODE` command below.

Pk Threshold

Specifies the minimum signal level for the N8201A internal peak identification routine to recognize as a peak. To be considered a peak, a signal must rise above the Peak Threshold value by at least the value specified in Peak Excursn, then fall back down by at least the Peak Excursn. This applies to all traces and all windows. Press ESC or select another active function to hide the threshold line. Applies to Next Peak, Next Peak Left, and Next Peak Right. If Peak Search is set to Param, it also applies to Peak Search.

Key Path: Peak Search, Search Param

Dependencies/Couplings: This function is not available when Y-Axis is set to Frequency instead of Amplitude.

State Saved: Saved in Instrument State.

Factory Preset: –90 dBm

Terminators: dBmV, dBµV, dBµA, V, W, A

Default Terminator: dBm

Resolution/Rounding/Truncation: .001 dBm

Range: From the current reference level to the bottom of the display range

Remote Command:

`:CALCulate:MARKer[1]|2|3|4:PEAK:THReshold <ampl>`

`:CALCulate:MARKer[1]|2|3|4:PEAK:THReshold?`

Remote Command Notes:

`CALC:MARK:PEAK:SEAR:MODE` must be set to `PARameter` if you want peak search to take advantage of the threshold excursion.

Example:

`:CALC:MARK:PEAK:THR -60 dBm` sets the threshold to -60 dBm.

See the full example for the `CALC:MARK:PEAK:SEAR:MODE` command below.

Peak Search

Sets the mode for Peak Search to either Max or Param and applies to Peak Search only.

- Max (Maximum mode) places a marker on the highest peak whenever a Peak Search is performed.
- Param (Parameter mode) searches only for peaks that meet the values set with Peak Excursn and Pk Threshold.

Key Path: Peak Search, Search Param

State Saved: Saved in Instrument State.

Factory Preset: Maximum

Remote Command:

```
:CALCulate:MARKer:PEAK[1]|2|3|4:SEARch:MODE
PARameter|MAXimum
```

```
:CALCulate:MARKer:PEAK[1]|2|3|4:SEARch:MODE?
```

Remote Command Notes:

If mode is set to MAXimum (Max), peak search will place the marker at the maximum amplitude in the trace. If mode is set to PARameter (Param), peak search will place the marker at the highest peak that rises and falls by at least the peak excursion above the peak threshold. If no peak meets the excursion and threshold criteria, a No Peak Found error (error 202) is issued.

The following commands are not affected by the setting of CALC:MARK:PEAK SEAR:MODE. They will always use the parameter search mode that defines peaks based on peak excursion and peak threshold.

```
:CALCulate:MARKer[1]|2|3|4:MAXimum
```

```
:CALCulate:MARKer[1]|2|3|4:MAXimum:LEFT
```

```
:CALCulate:MARKer[1]|2|3|4:MAXimum:NEXT
```

```
:CALCulate:MARKer[1]|2|3|4:MAXimum:RIGHt
```

```
:CALCulate:MARKer:PEAK:TABLe:STATe OFF|ON|0|1
```

Example:

`CALC:MARK:PEAK:SEARC:MODE PAR` sets the parameter search mode.

`CALC:MARK:PEAK:THR –60 dBm` sets the threshold to –60 dBm.

`CALC:MARK:PEAK:EXC 30 dB` sets the minimum peak excursion requirement to 30 dB.

`CALC:MARK:STAT ON` turns on marker number 1 and puts it on the active trace at mid screen.

`CALC:MARK:MAX` puts marker 1 on the highest peak that is at least 30 dB above the –60 dBm threshold.

`:CALC:MARK:Y?` returns the y-axis (amplitude) value of the marker in current y-axis units.

19 Preset

Presetting the instrument provides a known convenient starting point of the instrument state for making measurements. There are three possible actions when you press the Preset key:

- For preset type Mode (default), the green Preset key immediately performs a mode preset. See the descriptions below. Press System, Power On/Preset, Preset Type to select the preset type.
- For preset type Factory, the green Preset key immediately performs a factory preset. See the descriptions below. Press System, Power On/Preset, Preset Type to select the preset type.
- For preset type User, the green Preset key brings up a menu of preset key choices. You must press one of these keys to initiate an instrument preset.
  - Pressing User Preset resets to the settings/values that you have previously defined as the User preset state using the Save User Preset key.
  - Pressing Mode Preset does not change the mode; it only resets the current mode settings to the factory defaults.
  - Pressing Factory Preset resets the settings for all the modes to the factory defaults. The factory preset mode is Spectrum Analysis with continuous sweep. If you are not already in the Spectrum Analysis mode, it switches to that mode.
- Pressing Save User Preset saves the current user settings.

None of these instrument presets resets "persistent" functions such as GPIB address, time/date display style, or auto-alignment state to the factory defaults. See "Restore Sys Defaults" on page 231.

If Preset Type is set to Factory in the System menu, pressing the Preset front-panel key performs a factory preset, which implements the following:

- Resets the N8201A to Spectrum Analyzer mode.
- Brings up the Freq menu, with no active function.
- Sets certain conditions, in all modes, to their default values.
- Clears the input and output buffers and all the trace data.
- Turns off amplitude-correction factors, but they remain in N8201A memory.
- Turns off limit line testing, but the limit line tables remain in N8201A memory.
- The status byte is set to 0.

Recalling any state, including the user preset state, affects the conditions of more parameters than are affected by a factory preset. For example, external preamp gain and input impedance correction are not affected by a factory preset but are affected by a user preset.

Key Path: Front-panel key

Dependencies/Couplings: Depends on the preset type (user, mode or factory) setting in the System, Power On/Preset keys.

SCPI Status Bits/OPC Dependencies: Clears all pending OPC bits. The status byte is set to 0.

Remote Command:

`:SYSTem:PRESet`

Remote Command Notes:

The `SYSTem:PRESet` command immediately presets the instrument state to values dependent on the preset type that is currently selected (FACTory, USER, MODE).

`SYSTem:PRESet` does not reset "persistent" functions such as IP address, time/date display style, or auto-alignment state to their factory defaults. Use `SYSTem:PRESet:PERSistent`. See "Restore Sys Defaults" on page 498.

`SYSTem:PRESet:TYPE` sets the type of preset.

Example:

`:SYST:PRES:TYPE MODE` sets the preset mode type to mode. See "Preset Type" on page 478.

`:SYST:PRES` presets the instrument to the currently selected preset type.

User Preset

This key is only available when the preset type is set to User. Press System, Power On/Preset, Preset Type, User.

Restores the N8201A to a user defined state that has been saved for all N8201A modes. You defined this state when Save User Preset was pressed. If you have never saved a user preset state, then the factory preset state is stored as the user preset state. If the user preset state has been saved but the load fails for any reason, the error message: `Unable to load user state` is displayed in the status line and the state is reset to whatever it was before the Preset key was pressed. This can sometimes happen if firmware has been upgraded or applications have been uninstalled after the user preset state was saved. Save User Preset can be accessed by pressing System, Power On/Preset.

Key Path: Preset

Remote Command:

`:SYSTem:PRESet`. See “Preset" on page 441.

Example:

`SYST:PRES:SAVE` saves a user state that will be used for the preset

`SYST:PRES:TYPE USER` selects the user type preset

`SYST:PRES` immediately presets the N8201A to the user preset.

Mode Preset

This key is only available when the preset type is set to User. Press System, Power On/Preset, Preset Type, User.

A mode preset does not change the mode. It resets only the current mode settings to the factory defaults.

Key Path: Preset

Remote Command:

See "Preset" on page 441.

*RST

The *RST command always does a mode preset, except that it sets the instrument to do a single sweep/measurement instead of continuous.

Example:

SYST:PRES:TYPE MODE selects the mode type preset

SYST:PRES immediately presets the current N8201A mode

Factory Preset

This key is available only when the preset type is set to User. Press System, Power On/Preset, Preset Type, Factory.

A factory preset returns instrument settings to the factory default values. If you are not already in the spectrum analysis mode, it switches to that mode. A factory preset does *not* reset "persistent" functions such as time/date display style, or auto-alignment state (see "Restore Sys Defaults" on page 498.)

Key Path: Preset

Remote Command:

`:SYSTem:PRESet`. See ":SYSTem:PRESet" on page 186.

Remote Command Notes:

This command will not reset "persistent" functions such as GPIB address, time/date display style, or auto-alignment state to their factory defaults. Use `SYSTem:PRESet:PERSistent`. See "Restore Sys Defaults" on page 498.

Example:

`SYST:PRES:TYPE FACT` selects the factory type preset

`SYST:PRES` immediately presets the N8201A to its factory defaults

Save User Preset

This key is only available when the Preset Type is set to User. Press System, Power On/Preset, Preset Type, User.

Key Path:

Preset (if preset type is set to User)

System, **Power On/Preset**. See "Save User Preset" on page 20.

Remote Command:

```
:SYSTem:PRESet[:USER]:SAVE
```

Example:

```
SYST:PRES:TYPE USER

SYST:PRES:SAVE
```

20 Restart

This function restarts a previously paused measurement at the beginning. If the measurement is active, it will stop it as soon as possible and restart it from the beginning.If no measurement is active and Sweep (Single) is selected, a new sweep is initiated.

When in Average (On) mode, (BW/Avg, Average) the averaging function is restarted (the trace is reset and the average number is reset to zero).

Key Path: Front-panel key. It can also be found under Meas Control.

Remote Command:

`:INITiate:RESTart`

Remote Command Notes:

This command is equivalent to sending an `:ABORt` command followed by an `:INITiate[:IMMediate]` command. See "Abort the Sweep or Measurement (Remote Command Only)" on page 232 for more information.

Example:

```
INIT:REST
```

21 Single

If the N8201A is in continuous sweep mode and not in a measurement (Measure, Meas Off), pressing Single changes the sweep control to single sweep, and executes a sweep after the trigger condition is met. If the N8201A is already in single sweep, pressing Single executes a new sweep after the trigger condition is met.

Some instrument settings require more than one sweep to complete the measurement (see "BW/Avg" on page 91), or if you have selected a measurement from the functions under the MEASURE key, this function sets the trigger system to be initiated only once. In this case the trigger condition can be met only once and then all the necessary sweeps will be executed to make the measurement or complete the averaging function.

With Average on (BW/Avg, Average (On)), pressing Single resets the average trace and starts the average again from a count of zero. Sweeps are averaged until N sweeps are then taken (where N is the average number), and then the sweep is halted.

State Saved: Single sweep setting is saved in Instrument State

Factory Preset: Continuous

Remote Command:

```
:INITiate[:IMMediate]
```

```
*TRG
```

Remote Command Notes:

Use the `:TRIGger[:SEQuence]:SOURce` command to select the trigger source.

For more information, see"Trig" on page 527.

See also the *TRG command information in Chapter 27, "Using the STATus System".

Example:

```
*TRG
```

```
TRIG:IMM
```

22
Span / X Scale

Activates the Span function and displays the menu of span functions.

Span

Changes the displayed frequency range symmetrically about the center frequency. Setting the span to 0 Hz puts the N8201A into zero span.

Key Path: SPAN X Scale

Dependencies/Couplings: Span is coupled to center frequency. The maximum span may be limited by the center frequency setting.

State Saved: Saved in Instrument State

Factory Preset: 26.49 GHz

Terminators: GHz, MHz, kHz, Hz

Default Terminator: Hz

Range: 10 Hz to 26.5 GHz

Remote Command:

```
[:SENSe]:FREQuency:SPAN <freq>
[:SENSe]:FREQuency:SPAN?
```

Example:

```
FREQ:SPAN 2 GHZ
```

Span Zoom

Turns on signal tracking and activates the span function. Entering a new span value will then change the span while keeping the marker used for signal tracking centered on the screen. Pressing Span Zoom is the same as pressing: Frequency, Signal Track (On), and Span. See "Signal Track" on page 181.

Key Path: SPAN X Scale

State Saved: Saved in Instrument State

Remote Command:

No equivalent SCPI command.

Full Span

Changes the displayed frequency span to show the full frequency range of the N8201A. When using external mixing, it changes the displayed frequency span to the frequency range specified for the selected external mixing band.

Key Path: SPAN X Scale

Remote Command:

```
[:SENSe]:FREQuency:SPAN:FULL
```

Example:

```
FREQ:SPAN:FULL
```

Zero Span

Changes the displayed frequency span to zero Hertz. The horizontal axis changes to time rather than frequency. The input signal that is at the current center frequency is the displayed amplitude. This is a special operation mode that changes several measurement functions and couplings. The instrument behavior is similar to an oscilloscope with a frequency selective detector installed in front of the oscilloscope. See Application Note 150 for more information on how to use this mode.

Key Path: SPAN X Scale

Remote Command:

```
[:SENSe]:FREQuency:SPAN 0 Hz
```

Example:

```
FREQ:SPAN 0 Hz
```

Last Span

Changes the displayed frequency span to the previous span setting. If it is pressed immediately after Signal Track or Span Zoom is turned off, then span setting returns to the span that was in effect before these function were turned on.

Key Path: SPAN X Scale

Remote Command:

```
[:SENSe]:FREQuency:SPAN:PREVious
```

Example:

```
FREQ:SPAN:PREV
```

23 Sweep

Activates the Sweep Time function and displays the sweep function menu keys.

Key Path: Front-panel key

Sweep Time

Selects the length of time in which the N8201A sweeps the displayed frequency span. In swept spans, the sweep time varies from 1 millisecond to 2000 seconds plus time for setup which is not calculated as part of the sweep time. Reducing the sweep time increases the rate of sweeps. In zero span, the sweep time may be set from 1 µs to 6000 s. In FFT spans, the sweep time is not controlled by the user, but is an estimate of the time required to make FFT measurements. Sweep time is coupled to RBW and VBW, so changing those parameters may change the sweep time. When the N8201A has been set to FFT (that is, Auto Couple > FFT & Sweep > Manual), Sweep Time, and Auto Sweep Time are unavailable (grayed out).

You may select a sweep time less than the auto-coupled value; however this may generate measurement errors. If this happens, the error message: Meas Uncal will appear in the upper right corner of the display.

In zero span or FFT sweeps, the auto/manual function of this key is not applicable. When Sweep Time (Auto) is selected in non-zero span, any changes to Sweep Time while in zero span will revert to the Auto value when you return to non-zero span. When Sweep Time (Man) is selected in non-zero span, any changes to Sweep Time while in zero span will be maintained when you return to non-zero span (within the available sweep time range). When entering zero span from a non-zero span, the sweep time does not change.

Key Path: Sweep

Annunciation/Annotation: The sweep is displayed in the lower-right corner of the screen. Also, the points are displayed parenthetically.

State Saved: Saved in Instrument State

Factory Preset: Auto 66.24 mS

Default Terminator: seconds

Range:

- in zero span: 1 µs to 6000 s
- in swept spans: 1 ms to 4000 s

Remote Command:

```
[:SENSe]:SWEep:TIME <time>

[:SENSe]:SWEep:TIME?

[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:SWEep:TIME:AUTO?
```

Example:

```
SWE:TIME 500 ms
SWE:TIME:AUTO OFF
```

Sweep

Switches the N8201A between continuous-sweep and single-sweep mode. Pressing the front-panel Single key will also put the N8201A in single-sweep mode, then take a sweep.

Key Path: Sweep

State Saved: Saved in Instrument State

Factory Preset: Continuous

Remote Command:

```
:INITiate:CONTinuous OFF|ON|0|1
```

```
:INITiate:CONTinuous?
```

```
:INITiate:[IMMediate]
```

Remote Command Notes:

This command affects sweep if not in a measurement, and affects trigger when in a measurement. A “measurement” refers to any of the functions under the MEASURE key. This corresponds to continuous sweep or single sweep operation when not in a measurement, and continuous measurement or single measurement operation when in a measurement.

When *not* in a measurement, this command does the following:

- When ON at the completion of each sweep cycle, the sweep system immediately initiates another sweep cycle.
- When OFF, the sweep system remains in an “idle” state until CONTinuous is set to ON or an :INITiate[:IMMediate] command is received. On receiving the :INITiate[:IMMediate] command, it will go through a single sweep cycle, and then return to the “idle” state.
- The query returns 1 or 0 into the output buffer. 1 is returned when there is continuous sweeping. 0 is returned when there is only a single sweep.

When in a measurement, this command does the following:

- When ON at the completion of each trigger cycle, the trigger system immediately initiates another trigger cycle.
- When OFF, the trigger system remains in an “idle” state until CONTinuous is set to ON or an :INITiate[:IMMediate] command is received. On receiving the :INITiate[:IMMediate] command, it will go through a single trigger cycle, and then return to the “idle” state.
- The query returns 1 or 0 into the output buffer. 1 is returned when there is continuous triggering. 0 is returned when there is only a single trigger.

Use the :TRIGger[:SEQuence]:SOURce command to select the trigger source.

Example:

```
INIT:CONT OFF
```

Auto Sweep Time

Switches the N8201A between normal and accuracy sweep states. Provides you the ability to select the rules for the control of sweep time when Sweep Time is set to Auto. Setting Auto Sweep Time to Accy will result in slower sweep times, usually about three times as long, but better amplitude accuracy for CW signals. The instrument specifications only apply when Sweep Time is set to Auto, and Auto Sweep Time is set to Accy.

Additional amplitude errors occur when Auto Sweep Time is set to Norm are usually well under 0.1 dB, though they are not guaranteed. Because of the faster sweep times and still low errors, Norm is the preferred setting of Auto Sweep Time. Also, when the Auto All function is performed, Auto Sweep Time is set to Norm.

Key Path: Sweep

Dependencies/Couplings: Key is grayed out in Zero Span and FFT, but still shows user selected states (Norm or Accy). Goes to Norm on Auto All.

State Saved: Save

Factory Preset: Norm

Remote Command:

```
[:SENSe]:SWEep:TIME:AUTO:RULes NORMal|ACCuracy
```

```
[:SENSe]:SWEep:TIME:AUTO:RULes?
```

Example:

```
SWE:TIME:AUTO:RUL ACC
```

Gate

Turns the gate function on and off. When set On, the LO (local oscillator) sweeps whenever the gate conditions are satisfied by the signal at the Gate Source selected under Gate Setup. Turning on the Gate turns off Gate View (described below).

Some instruments require a hardware upgrade before gating can be used.

Because the LO is gated, the N8201A only sweeps while the gate is enabled. A complete sweep may require several gate events. The N8201A starts sweeping when the gate signal is enabled and stops when it is disabled, then continues sweeping when it is again enabled, and so on, until the sweep is complete. So, the actual sweep time may be longer than the displayed time since it assumes that the instrument is sweeping continuously, not stopping and starting in response to the gating signal. In addition, the sweep time can be five times slower then expected because the measurement is using a short gate delay or a short gate length. This slowing is needed because the resulting resolution bandwidth does not allow the required hardware settling time before starting to sweep.

The enabled or disabled state of the gate appears at the TRIGGER 2 OUT rear panel connector. A TTL high output indicates that the gate function is enabled. This is always true, whether the Gate itself is turned On or Off (except during alignments).

Option 124 is a Video Out connection. The y-axis video out signal is not available when gating is being used.

Key Path: Sweep

Dependencies/Couplings:

Gate is unavailable/off when:

- FFT & Sweep setting is Manual:FFT
- Signal Track on
- Marker Count on

These functions are unavailable whenever Gate is on:

- Manual:FFT (Auto Couple, FFT & Sweep, Manual:FFT)
- Signal Track (Frequency, Signal Track)
- Presel Center (Amplitude, Presel Center)
- Marker Count (frequency counter function)

State Saved: Saved in Instrument State

Factory Preset: Off

Remote Command:

```
[:SENSe]:SWEep:EGATe[:STATe] OFF|ON|0|1
```

```
[:SENSe]:SWEep:EGATe[:STATe]?
```

Example:

```
SWE:EGAT ON
SWE:EGAT?
```

Gate Setup

Accesses menu keys that setup various gate parameters.

Some instruments require a hardware upgrade before gating can be used.

Key Path: Sweep

Gate View

Gate View shows you a display of the gate settings referenced to the signal. The first vertical line is gray. It is the reference location for the gate delay and marks the point where the trigger conditions are met. The green line after that shows the end of the Delay period, where the gate is enabled. The second green line shows the end of the gate-enabled period. The time between the two green lines is Length.

When the gate view is turned on, the instrument is set to zero span. Gate View is automatically turned off if a span other than zero is selected. Whenever you are in gate view, the display is triggered from the Gate Source. The start of the trace begins a small amount of time before the trigger occurs. (Note that the gate itself is turned off when the gate view is displayed, otherwise you would not be able to see the full signal.) An example of a gate view display is shown below.

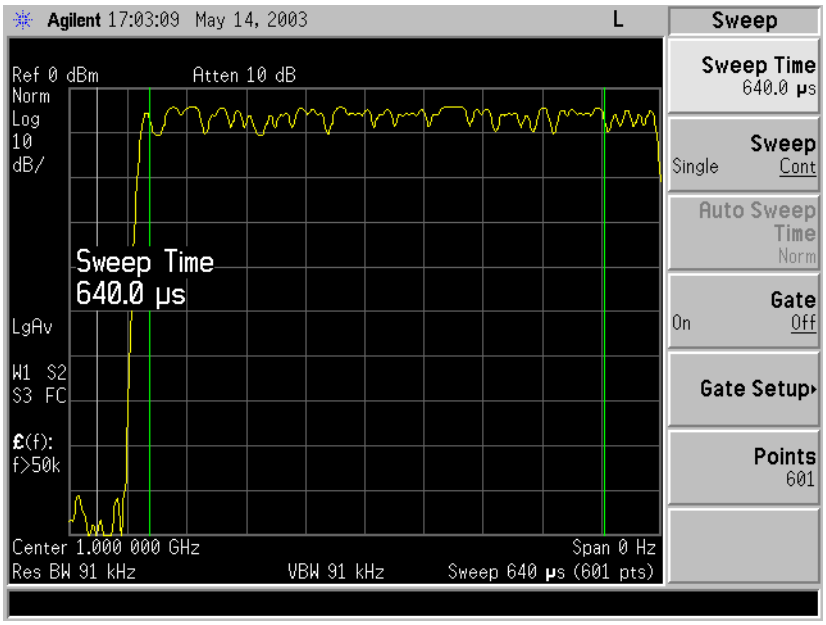


Figure 9 Gate View Display

You can view the gate lines while you adjust the gate delay and gate length so that the gate is enabled during the desired period, relative to the gate trigger signal.

Key Path: Sweep, Gate Setup

State Saved: Saved in Instrument State

Remote Command:

```
[:SENSe]:SWEep:EGATe:VIEW ON|OFF|1|0
[:SENSe]:SWEep:EGATe:VIEW?
```

Example:

```
SWE:EGAT:VIEW ON
```

Polarity

Sets the polarity for the gate signal. When Positive (Pos) is selected, a positive-going edge will satisfy the gate condition, after the delay is set with the Delay key. When Negative (Neg) is selected, a negative-going edge will satisfy the gate condition after the delay.

Key Path: Sweep, Gate Setup

State Saved: Saved in Instrument State

Factory Preset: Positive

Remote Command:

```
[:SENSe]:SWEep:EGATe:POLarity NEGative|POSitive
[:SENSe]:SWEep:EGATe:POLarity NEGative|POSitive?
```

Example:

```
SWE:EGAT:POL NEG
SWE:EGAT:POL?
```

Delay

Controls the length of time from the time the gate condition is satisfied until the gate is enabled.

Key Path: Sweep, Gate Setup

State Saved: Saved in Instrument State

Factory Preset: 57.7 µs

Resolution: 100 ns

Range: 0.0 µs to 100 seconds

Remote Command:

```
[:SENSe]:SWEep:EGATe:DELay <time>
[:SENSe]:SWEep:EGATe:DELay?
```

Example:

```
SWE:EGAT:DEL 100US
SWE:EGAT:DEL?
```

Length

Controls the length of time that the gate is enabled.

Key Path: Sweep, Gate Setup

State Saved: Saved in Instrument State

Factory Preset: 461.6 µs

Range: 10 µs to 0.5 s

Remote Command:

```
[:SENSe]:SWEep:EGATe:LENGth <time>
[:SENSe]:SWEep:EGATe:LENGth?
```

Example:

```
SWE:EGAT:LENG 1ms
SWE:EGAT:LENG?
```

Gate Source

Lets you select the input to which the gate signal will be applied.

Key Path: Sweep, Gate Setup

State Saved: Save

Factory Preset: Front (external 1 trigger input)

Remote Command:

```
[:SENSe]:SWEep:EGATe:SOURce EXTernal[1]|EXTernal2|RFBurst
```

where Ext1 selects the Front input and Ext2 selects the Rear input.

```
[:SENSe]:SWEep:EGATe:SOURce?
```

Example:

```
SWE:EGAT:SOUR EXT2
```

Trigger In

Selects the front panel external trigger input connector as the gate source and sets the voltage level at which the gate will trigger. Changes made to the trigger level setting with this key will also change the setting in the Trig menu.

Be careful about selecting trigger level values too far away from the trigger signal's midpoint. If the signal has ringing, it can cause multiple triggers.

NOTE **Ext Rear Trigger In 1.50 V** is not available on the N8201A

Key Path: Sweep, Gate Setup, Gate Source

State Saved: Saved in Instrument State

Factory Preset: 1.5 V

Range: – 5 to +5 V

Remote Command: See "Gate Source" on page 469.

```
[:SENSe]:SWEep:EGATe:EXTernal[1]:LEVel <voltage>
```

```
[:SENSe]:SWEep:EGATe:EXTernal[1]:LEVel?
```

Example:

```
SWE:EGAT:SOUR EXT1
```

```
SWE:EGAT:EXT1:LEV 2.5
```

RF Burst (IF Wideband)

Selects the signal as the gate source and triggers on the RF burst. This is the same trigger function as found under the Trig key. See the trigger functions for more information.

Key Path: Sweep, Gate Setup, Gate Source

State Saved: Saved in Instrument State

Remote Command: See "Gate Source" on page 469.

Example: `SWE:EGAT:SOUR RFB`

Points

Sets the number of points per sweep, from 101 to 8192 in non-zero span and 2 to 8192 in zero span. Resolution of setting the sweep time will depend on the number of points selected. If Factory Preset is selected, or the N8201A power is cycled, the number of points per sweep will default to 601. The current value of points is displayed parenthetically, next to the sweep time in the lower-right corner of the display.

Changing the number of points has several effects on the N8201A. Since markers are read at the point location, the marker reading may change. All trace data for the active trace is cleared. If sweep is set to Cont (Sweep, Sweep Cont), a new sweep begins immediately. If average is set to On (press BW/Avg, Average), the averaging starts over with a count of 0. If limit lines are set to On (press Display, Limits, Limit 1 or 2, Edit), the limit lines are updated.

By selecting a number of sweep points greater than 601, you are optimizing frequency resolution and accuracy while accepting a reduced measurement speed. In addition to sweep points, the span, resolution bandwidth, video bandwidth, average detection, and center frequency also affect measurement speed.

This function is coupled with the span setting. Increasing the span can change the number of sweep points. In order to maintain accurate measurements, the number of sweep points is increased if required to keep the width of each sweep point at most 150 MHz.

When zone span is set to On (press Span, Zone. Zone), each window has its own value for points.

Key Path: Sweep

State Saved: Saved in Instrument State

Factory Preset: 601

Range: 101 to 8192, 2 to 8192 in zero span

Remote Command:

```
[:SENSe]:SWEep:POINts <number of points>
[:SENSe]:SWEep:POINts?
```

Example:

```
SWE:POIN 501
SWE:POIN?
```

24 System

Key Path: Front-panel key

Remote Command:

There is no remote command for this key.

Show Errors

Accesses a display of the last 30 errors reported. The most recent error will appear at the top of the list. The first error listed will be the first error removed if the error list is longer than 30 entries. If the same error message occurs several times the error message will be incremented rather than added to the list as a new error message. If there is more than one of the same type of error, the date and time identify the first time and the last time an error occurred and the number of identical errors is shown.

A continuous recurring error reappears in the queue even if it had been cleared.

Key Path: System

Annunciation/Annotation: Textual Information Screen

Dependencies/Couplings: Removes any active functions.

Saved State: Not saved in Instrument State.

Factory Preset: Off

Remote Command:

```
:SYSTem:ERRor[:NEXT]?
```

Remote Command Notes:

The `:SYSTem:ERRor[:NEXT]?` command queries the earliest entry to the error queue and then deletes that entry.

Example:

`SYST:ERR? returns <error number>,<"error string">`, for example `-113,"Undefined header"`.

`*CLS` clears the entire error queue.

Previous Page

Displays the previous page of the Show Errors screen. This key is unavailable (grayed out) if there is no previous page.

Next Page

Displays the next page of the Show Errors screen. This key is unavailable (grayed out) if there is no next page.

Verbose SCPI On Off

Adds additional information to the error messages returned by the SYSTem:ERRor? command. It indicates which remote command was executing when the error occurred and what about that command was unacceptable.

Key Path: System, Show Errors

State Saved: Not saved in Instrument State.

Preset: Off. This parameter retains the setting previously selected, even through a power cycle.

Couplings and Dependencies: The verbose SCPI error debugging state is global to all the SCPI interfaces.

Remote Command:

```
:SYSTem:ERRor:VERBose OFF|ON|0|1
```

```
:SYSTem:ERRor:VERBose?
```

Remote Command Notes:

The SYST:ERR? query returns the following types of information for each error. <error number>,"<error message>;<annotated SCPI command>"

Example:

First set SYST:ERR:VERBOSE ON

If the command SENSe:FREQuently:CENTer 942.6MHz is sent, then sending SYST:ERR? returns:

```
-113,"Undefined header;SENSe:FREQuently:<Err>CENTer
942.6MHz $<NL>"
```

The <Err> shown after FREQuently shows you the spelling error. (The $<NL> is the typical representation for the command terminator.

If the command SENSe:FREQuency:CENTer 942.6Sec is sent, then sending SYST:ERR? returns:

```
-113,"Invalid suffix;SENSe:FREQuency:CENTer 942.6Sec<Err>
$<NL>"
```

The <Err> shown after Sec shows you the invalid suffix.

Clear Error Queue

Clears the front-panel error queue from the Show Errors display.

Key Path: System, Show Errors

Remote Command: `*CLS`

Power On/Preset

Displays keys that enable you to define the instrument power-on state and user preset state.

If Power On is set to Preset, and Preset Type is set to Factory, then turning on the N8201A performs a factory preset. The last state of the N8201A (before it was turned off) is recalled if Power On is set to Last. The user preset state is recalled if Power On is set to Preset and Preset Type is set to User. (However, if there is no user preset state saved, the N8201A performs a factory preset.)

Key Path: System

Power On

Enables you to set the state the N8201A will be put in when it is powered on. You can set the state to `Last` or `Preset`.

If Power On is set to Last, then the instrument returns to the last saved instrument state and all the modes are restored to that last state. The instrument saves its current state internally every 2 minutes. So the last saved state, that is restored at power-on, is the state at power-off or within a maximum of two minutes before power-off.

If Power On is set to Preset, the instrument state is determined by the preset type setting prior to turning the power off.

- Preset type Factory powers on in the Spectrum Analysis mode and all modes are set to their factory defaults.
- Preset type Mode powers on with the last mode the N8201A was in when it was powered off and presets that mode to the factory defaults. It also restores all other modes to their factory preset.
- Preset type User powers on with the user defined state, saved when a Save User Preset was last performed.

The setting (Last or Preset) of the Power On function is not changed by pressing Preset. Use the Power On/Preset menu key function to change the setting of the N8201A state that is recalled at power on. Limit lines are not recalled when the N8201A is powered on. Refer to "Preset" on page 441 for more information.

Key Path: System, Power On/Preset

State Saved: Survives preset and power cycle, but not saved in Instrument State.

Remote Command:

```
:SYSTem:PON:TYPE PRESet|LAST
```

```
:SYSTem:PON:TYPE?
```

Example:

`SYST:PON:TYPE LAST` defines the power on type as the last state the N8201A was in before power was turned off.

`SYST:PON:TYPE?`

Preset Type

Enables you to select what type of preset will be initiated when you press the green Preset key or send the remote command, using `SYST:PRES`. Choose between `Factory`, `Mode`, or `User` defined presets.

Key Path: System, Power On/Preset

State Saved: Survives Preset and power cycle, but is not saved in Instrument State.

Preset: Does not change the Preset Type.

Factory Default: Mode

Remote Command:

`:SYSTem:PRESet:TYPE FACTory|USER|MODE`

`:SYSTem:PRESet:TYPE?`

Remote Command Notes:

`SYSTem:PRESet:USER:SAVE` defines the user preset.

Example:

`SYST:PRES:TYPE FACT` defines the type of preset as the factory preset.

User

Sets the preset type to User. When Preset is pressed, the instrument state that you have defined as the user preset setting is restored. Use the Save User Preset key to define your user preset settings. Refer to "Preset" on page 441 for more information. If you have not saved a user state, then the instrument will save the power-up state for you to use as a default user preset state.

Key Path: System, Power On/Preset, Preset Type

Readback: User

State Saved: Survives Preset and power cycle, but not saved in Instrument State.

Factory Default: Mode

Remote Command: `Preset Type`

Example:

`SYST:PRES[:USER]:SAVE` saves the current state to be used as the preset user state.

`SYST:PRES:TYPE USER` defines the type of preset as the user preset.

With user preset selected, and a user state saved, use `SYST:PRES` to do a user preset.

Mode

Sets the preset type to "Mode." When you do a preset, the current mode factory default instrument state will be restored. A mode preset does not change the mode. Refer to "Preset" on page 441 for more information.

Key Path: System, Power On/Preset, Preset Type

Readback: Mode

Dependencies/Couplings: None

State Saved: Survives Preset and power cycle, but not saved in Instrument State.

Factory Default: Mode

Remote Command: `:SYSTem:PRESet:TYPE "Preset Type"`

Example:

`SYST:PRES:TYPE MODE` defines the type of preset as the mode preset.

After you have selected mode as the preset type, use `SYST:PRES` to do a mode preset.

Factory

Sets the preset type to "Factory." When you do a preset, all of the factory default instrument state will be restored. A factory preset switches the N8201A to the Spectrum Analysis mode and resets the settings of all the modes to the factory defaults (that is, Spectrum Analysis Mode with continuous sweep). Refer to "Preset" on page 441 for more information.

Key Path: System, Power On/Preset, Preset Type

Annunciation/Annotation: Factory

State Saved: Survives Preset and power cycle, but not saved in Instrument State.

Factory Default: Mode

Remote Command: `"Preset Type"`

Example:

`SYST:PRES:TYPE FACT` defines the type of preset as the factory preset.

With factory preset selected, use `SYST:PRES` to do a factory preset.

Save User Preset

Saves the current state of the N8201A into the User Preset state register for recall when the instrument Preset Type is set to User and you perform a preset operation. After you save a state here, you must go to the Preset Type key and select User in order to have this state used as the preset state. Refer to "Preset" on page 441 key description for the default factory-configuration settings.

Key Path: System, Power On/Preset

Preset, if the preset type is set to `User`. See "Save User Preset" on page 447.

Remote Command:

`:SYSTem:PRESet[:USER]:SAVE`

Example:

`SYST:PRES:SAVE`

Use `SYST:PRES:TYPE USER` to set factory preset type to "`User`."

Then use `SYST:PRES` to do the preset.

Time/Date

Displays the Time/Date function menu keys used to set and display the real-time clock.

Key Path: System

Remote Command:

There is no remote command for this key.

Time/Date

Turns the display of the real-time clock on or off.

Key Path: System, Time/Date

Annunciation/Annotation: Current time and date are displayed in the upper-left corner of the screen.

State Saved: Survives Preset and power cycle, but not saved in Instrument State.

Factory Default: On (Restored by System, Restore Sys Defaults.)

Remote Command:

```
:DISPlay:ANNotation:CLOCk[:STATe] ON|OFF
```

```
:DISPlay:ANNotation:CLOCk[:STATe]?
```

Example:

```
DISP:ANN:CLOC ON
```

Date Format

Enables you to set the date display to month-day-year or day-month-year. It is set to a month-day-year format when the instrument System Defaults are restored. This key only affects display of date at the top of the screen, not in the file catalog.

Key Path: System, Time/Date

State Saved: Survives Preset and power cycle, but not saved in Instrument State.

Factory Default: `MDY` (Restored by System, Restore Sys Defaults.)

Remote Command:

```
:DISPlay:ANNotation:CLOCk:DATE:FORMat MDY|DMY
```

```
:DISPlay:ANNotation:CLOCk:DATE:FORMat?
```

Example:

```
DISP:ANN:CLOC:DATE:FORM DMY
```

Set Time

Enables you to set the time of the real-time clock. Enter the time in 24 hour `HHMMSS` format.

Key Path: System, Time/Date

State Saved: Survives Preset and power cycle, but not saved in Instrument State.

Range:

Hour (`HH`): 00 to 23.

Minute (`MM`): 00 to 59.

Second (`SS`): 00 to 59.

Remote Command:

```
:SYSTem:TIME <hour>,<minute>,<second>
```

```
:SYSTem:TIME?
```

Example:

`SYST:TIME 12,42,00` Sets the clock to 12:42:00 PM.

Adjust Time Setting (Remote Command Only)

Adjust the instruments internal time by the value entered.

Key Path: System, Time/Date

DefaultTerminator seconds

Remote Command:

```
:SYSTem:TIME:ADJust <seconds>
```

Example:

`SYST:TIME:ADJ 3600` will advance the time one hour.

`SYST:TIME:ADJ -86400` will back the date up one day, without changing the time of day (minutes or seconds).

Set Date

Allows you to set the date of the real-time clock. Enter the date in the YYYYMMDD format.

Key Path: System, Time/Date

State Saved: Survives Preset and power cycle, but not saved in Instrument State. Not restored by System, Restore Sys Defaults.

Range:

Year (YYYY): 1970 to 2029

Month (MM):01 to 12

Day: 01 to 30 or 31 (depending on the month)

Remote Command:

```
:SYSTem:DATE <year>,<month>,<day>
```

```
:SYSTem:DATE?
```

Example:

`SYST:DATE 2000,12,24` Sets the date to December 24, 2000

Alignments

Displays functions that control the automatic alignment of the instrument and load default values for the alignment system.

NOTE

Most CALibration commands execute in the background, permitting other SCPI commands to be processed concurrently. If a measurement command is sent right after a CALibration command, there can be interaction between background alignments and the measurement. The *WAI command should be issued after any CALibration command and before the measurement command. Note that sending the query form of a CAL? command will automatically hold off any following commands until the query value is returned.

Bit 0 (CALibration) must be set to 1 in the STATus:OPERation:ENABle register to ensure that the *WAI command waits for calibration to complete. This is the factory preset and *RST setting.

Key Path: System

Remote Command:

There is no remote command for this key.

Auto Align

Allows you to turn the instrument automatic alignment On or Off or select Alert to be alerted that alignments are needed.

Off - This setting has been changed to work the same as the Alert selection. It is very important to know that you have turned off the alignments since, over time, leaving them permanently off will result in measurement inaccuracies.

On - The instrument behaves like the Alert, but will automatically perform a full alignment when it is needed. In addition, every 15 minutes passing or 1.5 degrees temperature change will cause just the RF system gain to be aligned, to achieve the best absolute amplitude accuracy. For either alignment, the instrument will stop any measurement currently in process, perform the full alignment, then restart the measurement from the beginning (similar to pressing Restart). If any alignment FAILs or is ABORTed by the user (for example, ESCape key), the instrument will wait 5 minutes before retrying the necessary alignment. This helps to avoid infinite recursive loops of alignment behavior in the event of broken hardware. When Auto Align, On is selected, “AA” appears along the left edge of the display. Also see “Align All Now" on page 485.

Alert - A 3 degree (Celsius) temperature change or a time span of 24 hours since the last successful Full alignment (for example, Align All Now) will trigger an alert that alignments need to be done, but no alignments will be performed without user input. When Auto Align, Alert is selected, “AL” appears along the left edge of the display.

There are 2 very quick alignments, invisible to the user, that are done every few minutes or when certain settings are changed. These still occur, even if AutoAlign is set to Off. These alignments are the Current SysGain and Current IF Flatness methods which can also be forced to occur by user under the Align Subsys menu.

Key Path: System, Alignments

State Saved: Survives Preset and power cycle, but not saved in Instrument State.

Remote Command:

`:CALibration:AUTO OFF|ON|ALERt`

`:CALibration:AUTO?`

Example:

`CAL:AUTO ON`

Align All Now

Immediately executes an alignment cycle of all the subsystems (Align RF, Align IF, Align ADC, and Align Current Sys Gain). The instrument will stop any measurement currently underway, perform the full alignment, then restart the measurement from the beginning (similar to pressing the Restart key). All other operations are stopped and the alignments will be visible on the display.

Key Path: System, Alignments

Remote Command:

`:CALibration[:ALL]` Performs a full alignment.

The following three commands perform a full alignment and return a number indicating the success of the alignment. A zero is returned if the alignment is successful. A one is returned if any part of the alignment fails.

`:CALibration[:ALL]?`

`*CAL?`

`*TST?`

Example:

`CAL?` The query performs a full alignment and returns a number indicating the success of the alignment. A zero is returned if the alignment is successful.

Frequency Corrections (Remote Command Only)

Turns the internal frequency corrections on/off.

Saved State: Not saved in instrument state

Factory Preset: On

Remote Command:

```
:CALibration:FREQuency[:STATe] OFF|ON|0|1
```

```
:CALibration:FREQuency[:STATe]?
```

Example:

```
CAL:FREQ OFF
```

Align Subsys

Accesses the keys to immediately execute an alignment of one of the subsystems (Align RF, Align IF, Align ADC, and Align Current Sys Gain). When one of the subsystem alignments is started, all other operations are stopped and any alignment messages will be visible on the display.

Key Path: System, Alignments

Remote Command:

There is no remote command for this key.

Align RF

Initiates an alignment on the RF assembly.

Key Path: System, Alignments, Align Subsys

Annunciation/Annotation: Displays a series of pop-up message boxes, indicating an alignment is in progress.

If a signal is present that interferes with the alignment a message `Align RF 50 MHz signal detected.` will be displayed.

SCPI Status Bits/OPC Dependencies: Status questionable calibration. Bits 3, 11, or 12 will be set if Align RF fails

Remote Command: `:CALibration:RF`

```
:CALibration:RF?
```

Remote Command Notes: The query performs the alignment and returns a zero if the alignment is successful.

Example: `CAL:RF?`

Align IF

Initiates an alignment on the IF assembly.

Key Path: System, Alignments, Align Subsys

Annunciation/Annotation: Displays a series of pop-up message boxes indicating alignment progress.

SCPI Status Bits/OPC Dependencies: Status questionable calibration Bit 4 will be set if Align RF fails.

Remote Command:

`:CALibration:IF`

`:CALibration:IF?`

Remote Command Notes: The query performs the alignment and returns a zero if the alignment is successful.

Example: `CAL:IF?`

Align ADC

Initiates an alignment on the ADC circuitry.

Key Path: System, Alignments, Align Subsys

Annunciation/Annotation: Message boxes indicating alignment of ADC progress.

SCPI Status Bits/OPC Dependencies: Status questionable calibration Bit 6 will be set if Align ADC fails.

Remote Command:

`:CALibration:ADC`

`:CALibration:ADC?`

Remote Command Notes: The query performs the alignment and returns a zero if the alignment is successful.

Example: `CAL:ADC?`

Align Current IF Flatness

Initiates an alignment of the current IF flatness, for the purpose of improving absolute amplitude within FFT Sweeps and improving group delay in some digital demodulation measurements.

Key Path: System, Alignments, Align Subsys

Annunciation/Annotation: Displays a series of pop-up message boxes explaining what is being aligned (a subset of the Align All Now message boxes).

Remote Command:

```
:CALibration:FLATness:IF
```

```
:CALibration:FLATness:IF?
```

Remote Command Notes: The query performs the alignment and returns a zero if the alignment is successful.

Example: `CAL:FLAT:IF?`

Align Current SysGain

Initiates a fine-tuning adjustment of the system gain, primarily to correct for small amplitude variations that occur as resolution BW is switched.

Key Path: System, Alignments, Align Subsys

Annunciation/Annotation: Displays a series of pop-up message boxes explaining what is being aligned (a subset of the Align All Now message boxes).

Remote Command:

```
:CALibration:GAIN:CSYStem
```

```
:CALibration:GAIN:CSYStem?
```

Remote Command Notes: The query performs the alignment and returns a zero if the alignment is successful.

Example: `CAL:GAIN:CSYS?`

Align Audio Digitizer Gain

Initiates an alignment of the various gain settings of the 100 kΩ input path (Option 107)

Key Path: System, Alignments, Align Subsys

Annunciation/Annotation: Displays a series of pop-up message boxes explaining what is being aligned (a subset of the Align All Now message boxes).

Remote Command:

```
:CALibration:GAIN:ADIGitizer
```

```
:CALibration:GAIN:ADIGitizer?
```

Remote Command Notes: The query performs the alignment and returns a zero if the alignment is successful.

Example: `CAL:GAIN:ADIG?`

Restore Align Defaults

Loads the default values for the alignment system, turns on the frequency corrections, and resets the timebase to the factory values. Align All Now must be executed 3 times after pressing Restore Align Defaults to meet specifications.

Key Path: System, Alignments

Annunciation/Annotation: System Alignments, Align Now All required.

SCPI Status Bits/OPC Dependencies: Status questionable calibration Bit 14 will be set.

Remote Command:

```
:CALibration:DATA:DEFault
```

Example:

```
CAL:DATA:DEF
```

Select Time Corrections (Remote Command Only)

Controls time corrections used to compensate for the complex (magnitude and phase) response of the analog and digital IF hardware. When only scalar (magnitude) FFT flatness is required, time corrections take more CPU cycles and so are less efficient than frequency corrections. For demod or other time-based (not FFT) measurements, only time corrections can improve the flatness that results from imperfect IF hardware. When the time correction functionality is set to Auto (the default), the individual measurements activate the corrections when they are needed.

Turning time corrections on or off affects all measurements. Time corrections should be left in Auto unless you have specific reasons for forcing them on or off.

Factory Preset: Auto

Remote Command:

```
:CALibration:TCORrections AUTO|ON|OFF
```

Example:

```
CAL:TCOR OFF
```

Config I/O

NOTE This key and sub key functions do not apply to the N8201A.

Reference

Displays functions that control the external frequency reference.

Key Path: System

Remote Command:

There is no remote command for the system key. Refer to the remote commands in the "Freq Ref" on page 492. These commands enables you to select an external frequency reference source and specify a value.

Freq Ref

Specifies the frequency reference as being internal or external. If the frequency reference is specified as internal, the frequency of the reference is automatically identified as being 10 MHz. If the frequency reference is specified as external, you must enter the frequency of the external reference being used. If External Reference is selected, Ext Ref will appear on the right side of the display.

The frequency of an external frequency reference is not automatically detected. If an external frequency source is selected, the frequency of the source must be entered.

If Ext is selected, and you press Freq Ref, Ext will remain selected and the Ext reference frequency will become the active function. If Freq Ref is pressed again, Int will become selected (at 10 MHz). The Ext reference frequency is remembered and will be used again if Ext is selected.

If the external reference is missing or out of range, or the frequency reference is unlocked, the message `"External reference missing or out of range"`, will appear on the display.

Key Path: System, Reference

State Saved: Not saved in Instrument State. Neither the external reference frequency nor the state of this function (Int or Ext) are affected by factory preset or power cycle. Reset to the factory default (Int, 10 MHz) by pressing System, Restore Sys Defaults.

Default: Internal, 10 MHz

Range: 1 MHz to 30 MHz

Remote Command:

```
[:SENSe]:ROSCillator:SOURce INTernal|EXTernal

[:SENSe]:ROSCillator:SOURce?

[:SENSe]:ROSCillator:EXTernal:FREQuency <value>
```

```
[:SENSe]:ROSCillator:EXTernal:FREQuency?
```

Example:

Before switching to the external reference source, specify the frequency of the external reference that you plan to use.

`ROSC:EXT:FREQ 20 MHz` sets the external reference frequency to 20 MHz, but does not select the external reference.

`ROSC:SOUR EXT` selects the external reference.

10 MHz Out

Switches the 10 MHz out signal on the front panel of the N8201A on or off.

Key Path: System, Reference

State Saved: Not saved in Instrument State. Not affected by factory preset or power cycle. Reset to the factory default (Off, 10 MHz) by pressing System, Restore Sys Defaults.

Remote Command:

```
[:SENSe]:ROSCillator:OUTPut[:STATe] OFF|ON|0|1
```

```
[:SENSe]:ROSCillator:OUTPut[:STATe]?
```

Example:

```
ROSC:OUTP ON
```

Show System

Displays the number and description of the options installed in your instrument. It also displays the instrument model number, product number, serial number, ethernet address, host ID, firmware revision, revision date, options, and system statistics.

Key Path: System

Annunciation/Annotation: Text Screen

Dependencies/Couplings: Active function is disabled.

Remote Command:

`*IDN?` Returns four fields separated by commas:

- Manufacturer
- Model
- Serial number
- Firmware version

Example of returned string:
`Agilent Technologies,N8201A,US00000123,A.01.01`

`:SYSTem:OPTions?`

`*OPT?`

Returns a string of all the installed instrument options. It is a comma separated list such as: “BAC,BAH,226” (includes quotes).

Example:

```
*IDN?

*OPT?
```

Show Hdwr

Gives detailed information about the hardware installed on your instrument.

Key Path: System

Annunciation/Annotation: Text screen

Dependencies/Couplings: Active function is disabled

Remote Command:

```
:SYSTem:CONFigure:HARDware OFF|ON|0|1
```

Example:

```
SYST:CONF:HARD OFF
```

Color Palette

Displays the Color Palette menu keys that set the display screen attributes.

Key Path: System

State Saved: Not saved in Instrument State, survives Preset, and power cycle.

Remote Command:

There is no remote command for this key.

Default

Selects the factory default color palette.

Dependencies/Couplings: None

Key Path: System, Color Palette

Vision Impair 1

Selects a special color scheme to accommodate color-deficient vision problems.

Key Path: System, Color Palette

Remote Command:

There is no remote command for this key.

Vision Impair 2

Selects a special color scheme to accommodate color-deficient vision problems.

Key Path: System, Color Palette

Remote Command:

There is no remote command for this key.

Optical Filter

Selects a special color scheme to accommodate protective goggles while viewing lasers.

Key Path: System, Color Palette

Remote Command:

There is no remote command for this key.

Monochrome

Sets the color palette to single-color mode. The monochrome display uses different shades of green for each green value. This is especially useful for driving external monochrome monitors.

Key Path: System, Color Palette

Remote Command:

There is no remote command for this key.

Diagnostics

Access front-panel diagnostic functions.

Key Path: System

Remote Command:

There is no remote command for this key.

Front Panel Test

Used to test the front-panel keys. It shows a list of all the front-panel keys with counter numbers indicating the number times the key is pressed. Press the **ESC** key to exit the test mode and return to the menu.

Key Path: System, Diagnostics

Annunciation/Annotation: Text Screen

Dependencies/Couplings: The active function is disabled.

Restore Sys Defaults

Resets the system settings, including most "persistent" functions, to their factory defaults. It also does a Factory Preset that resets the GUI to the Spectrum Analysis Mode. It does *not* reset user data such as saved instrument states.

Persistent functions include the time/date display style and auto-alignment state. These are parameters that are unaffected by a power cycle or an instrument preset.

Table 12 System Default Settings

Feature	Default Setting	Restored?
Automatic Alignment On/Alert/Off	On	yes
Power On Last/Preset	Preset	yes
Preset Type Factory/User/Mode	Mode	yes
External Amplifier Gain	0 dBm	yes
Input Impedance	50 Ohm	yes
SCPI Telnet Port 5023	On	yes
SCPI Socket Port 5025	On	yes
SICL Server	On	yes
Instrument Color Palette	Default palette	yes
Date Format	MDY	yes
Time Date Display	On	yes
Verbose (error messages)	Off	yes
Manual Tracking Adjustment	2048	yes

Key Path: System

Remote Command:

```
:SYSTem:PRESet:PERSistent
```

Example:

```
SYST:PRES:PERS
```

Licensing

Accesses the security system to enable licensing for individual options. You can install measurement mode personality options in an instrument at any time After you load the personality mode into memory, you must enter a license key to allow access to the option.

Not all options can be enabled using this system and there is no way to turn *off* an option through this system. Once an option has been licensed for a given N8201A, it cannot be transferred to a different N8201A.

Key Path: System

Remote Command:

There is no remote command for this key.

Option

Activates the alpha editor enabling you to enter the designation for the option to be installed. An option is a three character string that specifies the option or application that is to be installed, as found in the catalog. To terminate the entry, press Enter or Return. An external keyboard may also be used for this entry. The option number appears on the second line of the Option key.

Key Path: System, Licensing

Remote Command:

See "Licensing" on page 498.

Example:

```
SYST:LKEY "B78", "B62A35B37679"
SYST:LKEY? "B78"
```

License Key

Activates the alpha editor to allow you to enter the license key number for the option to be installed. The license key number is a hexadecimal number that requires entry of both letters and numbers. Use the front-panel numeric keyboard to enter numerical values. You will see your entry in the active function area. A license key is a 12-character hexadecimal string given with the option. The license key is unique to a specific option installed and instrument host ID. To terminate the entry, press Enter or Return. An external keyboard may also be used for this entry. The license key number will appear on the second line of the License Key menu key.

Key Path: System, Licensing

Factory Preset: Clears the current value.

Remote Command:

```
:SYSTem:LKEY <"option">, <"license key">
```

```
:SYSTem:LKEY? <"option">
```

Remote Command Notes:

The query returns a string that contains the license key for a specified application or option that is already installed in the instrument. The license key will also be returned if the application is not currently in memory, but had been installed at some previous time. The license key is unique to a specific option, host ID and serial number. Host ID can be returned by `:SYSTem:HID?`.

Example:

```
SYST:LKEY "B78", "B62A35B37679"
SYST:LKEY? "B78"
```

The query would return "B62A35B37679"

If the instrument does not have a license key for that option, the query would return "".

Activate License

Activates the specified option. When a valid option key number and license key number have been entered, press Activate. If your entry was correct, the option will be enabled and the message: Option activated will appear in the status line of your display. The option number and license key number will also be cleared from the License Key and Option key.

If your entry was incorrect, the error message: License key invalid will appear in the status line of your display. The option number and license key number can be edited until they are correct.

It is possible to enable an option for which the N8201A is not yet configured. Therefore, the message Option activated does not mean that the option will immediately function. For a display of options that are enabled and for which the N8201A is properly configured, press **System, More, Show System**.

Key Path: System, Licensing

Remote Command:

There is no remote command for this key.

Delete License

Deletes the license key from memory, however, the option firmware is not deleted. The instrument must be rebooted before the option is removed.

Key Path: System, Licensing

Remote Command:

```
:SYSTem:LKEY:DELete <'application option'>
```

Example:

```
SYST:LKEY:DEL "BAC"
```

Show License

Displays the number and description of the licenses installed in your instrument.

Key Path: System, Licensing

Annunciation/Annotation: Text Screen

Dependencies/Couplings: The active function is disabled.

Remote Command:

There is no remote command for this function.

Install an Application Mode (Remote command only)

Installs the specified application from an external drive to the instrument. Each application allows you to make a specific set of measurements easily and accurately. Installation requires a 12-character license key, which you should have received with your application. The license key number is unique to the option and instrument serial number. If it cannot be located, contact your local Agilent Technologies and service office to re-obtain the information. (Have the instrument model number, host ID, and serial number available.)

Remote Command:

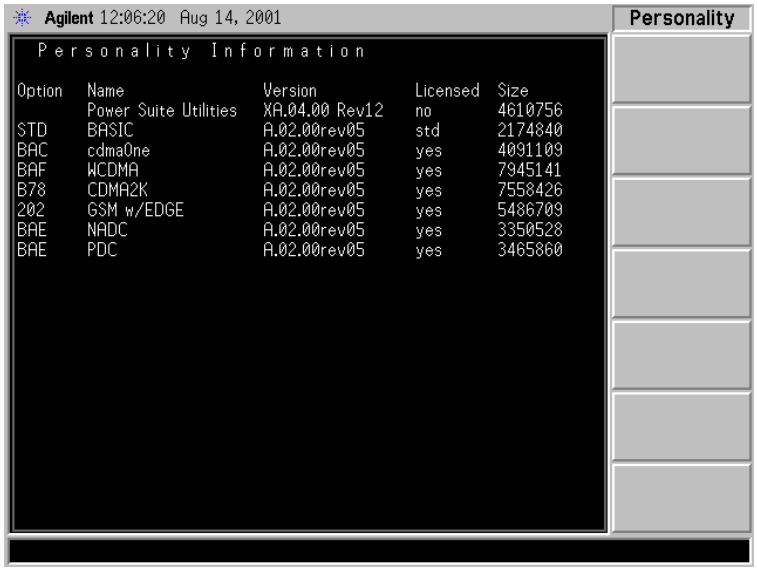
See also `*OPT?`

Example:

`*OPT?` returns a string with all the application options currently installed in the instrument (for example, "B7J,202,204,BAC").

Personality

Pressing Personality displays information about the personalities installed and their license status, as shown in the following illustration.


Agilent 12:06:20 Aug 14, 2001
Personality
Personality Information
Option Name Version Licensed Size
Power Suite Utilities XA.04.00 Rev12 no 4610756
STD BASIC A.02.00rev05 std 2174840
BAC cdmaOne A.02.00rev05 yes 4091109
BAF WCDMA A.02.00rev05 yes 7945141
B78 CDMA2K A.02.00rev05 yes 7558426
202 GSM w/EDGE A.02.00rev05 yes 5486709
BAE NADC A.02.00rev05 yes 3350528
BAE PDC A.02.00rev05 yes 3465860

Key Path: System

Annunciation/Annotation: Text Screen

Dependencies/Couplings: The active function is disabled.

Security

Pressing Security brings up the Security menu.

Key Path: System

Dependencies/Couplings: The active function is disabled.

Remote Command:

There is no remote command for this key.

Secure Erase All

Erases all persistent storage in the instrument. When pressed, the N8201A will display the following message: "This key will delete all data and firmware in the instrument. You will need to reinstall firmware after executing this operation. Press the key again if you wish to proceed." Thus, this key requires two presses to select the function. Upon the second press, the instrument displays the following message: "Please Confirm Erase Operation. Press Yes to erase all data and firmware from the instrument. Press No to cancel the operation." Refer to "Managing Security" on page 506.

Key Path: System, Security

Remote Command:

```
:SYSTem:SECurity:CLEAr
```

Remote Command Notes:

This command blocks the parser until the command is completed. Since this command also causes the instrument firmware to be turned off, no further communication with the instrument will be possible.

Example:

```
SYST:SEC:CLEA
```

Secure Erase User

This key is only active if Option 117 is licensed. Erases the compact Flash on the USB/Compact Flash Interface board. This includes all saved states and traces. When this key is pressed, the instrument displays the following message: "This key will reformat the C:drive and erase all user data from the instrument. You will lose all saved states and traces. Press the key again if you wish to proceed." Thus, this key requires

two presses to select the function. Upon the second press, the instrument displays the following message: "Please Confirm Erase Operation. Press Yes to reformat C: and erase all saved states and traces. Press No to cancel the operation."

Key Path: System, Security

Dependencies/Couplings: Requires Option 117 to be installed and licensed.

Remote Command:

```
:SYSTem:SECurity:IMMediate
```

Remote Command Notes:

This command blocks the parser until the command is completed.

Example:

```
SYST:SEC:IMM
```

Security

This key controls whether the instrument is currently in its secure mode or not. When Security is On, the instrument cannot write to any location on the main Flash memory. When Security is Off, the main Flash memory can be written to. When Security is in the Enabled mode, the instrument is configured to turn on the security mode upon the next power-on cycle.

If you ordered Option 117, the Secure Memory Erase option was loaded into the memory of your instrument and licensed at the factory but not enabled.

DO NOT enable Option 117 until you have fully configured your instrument (set the System, Config I/O settings as needed, added or removed options and licenses, and configured the power-up state you desire).

After the security mode is enabled, the main Flash memory becomes read-only, rather than read/write memory. This makes it impossible to add or remove personalities or their license keys, or otherwise change the instrument's configuration, unless you do a firmware upgrade or the System, Security, Secure Erase All procedure. This procedure will render the instrument inoperable. You will then need to run the upgrade procedure (on the Agilent Web site) to reinstall the firmware and completely reconfigure your instrument. After reinstalling the firmware, Security will be disabled. Refer to "Managing Security" on page 506 in this chapter.

When you are totally satisfied with the configuration of your N8201A, enable the Secure Memory Erase option by pressing System, Security, Security Enabled. The security mode will then be enabled the next time the N8201A's power is cycled.

Key Path: System, Security, Security

Remote Command:

```
:SYSTem:SECurity:ENABle ON|OFF

:SYSTem:SECurity:ENABle?
```

Remote Command Notes:

This command allows the security state to be set and queried from a SCPI port. Note that the command sets security to the "enabled" mode, which will turn on the security mode at the next power-on cycle. When the parameter is OFF, the security mode will be set to off only if the current security mode is "enabled" or "off." If the security mode is on, this command has no effect. The query form of the command always returns the current state of the security mode (ON, OFF, or ENAB).

Example:

```
SYST:SEC:ENAB ON
```

Managing Security

Secure Erase All Function

CAUTION

Secure Erase All will render the instrument inoperable. All instrument settings under System, Config I/O, such as the LAN address or gateway address will be lost. All instrument option License Keys, such as those that enable the optional preamplifier or measurement personalities, will be lost.

The following procedure outlines how to prepare *prior* to executing Secure Erase All, and how to recover the instrument following the Secure Erase All.

Be sure to back up the instrument configuration and option keyword information via LAN using the N8201A Series Firmware Upgrade Program before the instrument is placed in the secure area.

Preliminary Procedure (Non-secure Area)

Perform this procedure once on the `N8201A` prior to placing it into a secure area, and every time the instrument has been calibrated or repaired.

1. Record the Ethernet Number of the instrument. Press **System, More, Show System**. The Ethernet Number is a 12-digit alphanumeric string with a hyphen between the first and last set of six characters; for example, 001083-b80c55. Having this number recorded will save time when you re-install the firmware into the instrument using the "Re-installation of Firmware Procedure."
2. Record the IP Address of the instrument. Press **System, Config I/O**. This address may be changed by someone using the instrument in the secure environment, but at least you will have documented what it was.
3. Obtain a list of the License Keys by saving a screen capture of the instrument's Licensing screen. Even though the next section tells you how to backup these keywords to a PC, the PC may not be available when you need it. Press **System, More, More, Licensing, Show License**. Use the file manager to save an image of the screen to a formatted disk. Insert the disk in the front panel disk drive and press **File, Save, Type, Screen, Format, Bitmap** and select Directory A. Press **Save Now**. The file can be displayed or printed from any application capable of reading bitmap (.bmp) files. Before proceeding, verify that the screen capture of the License Keys has been properly saved to the disk by opening the file using a PC.

The licensing information can also be printed if the N8201A is connected to a printer. As a last resort, write down the `Option` number and `License Key` for each option.

Properly store the License Key data, since it will be needed to recover the instrument.

Backing-up Configuration and Option License Keys to a PC (Non-secure Area)

1 Load the N8201A Series Firmware Update Program from the following Agilent Web site:

http://www.agilent.com/find/psa_firmware. Click on the PSA firmware update.

Begin the firmware upgrade procedure. Accept the licensing agreement. When prompted for an instrument IP address, enter the instrument's IP address.

2 Allow the configuration files to be saved to the default location on the PC.

3 The user data, options, and license keys are saved in a file named 'Config' under a directory that begins with the model number, followed by the serial number, then a date and time stamp on the C: drive of the PC; for example, "C:\N8201A\US42070187\15-Oct-02-11-29-AM\Config."

4 Make note of the path name. This file will be used to restore the N8201A's configuration and License Keys after Secure Erase All has been used to erase its memory.

5 When the screen regarding loading the operating system and options appears, exit the firmware upgrade process. At this point, you have saved the configuration files (including the License Keys). You do not need to continue with the actual firmware download.

Security Clearing Procedure (Secure Area)

- On the Spectrum Analyzer GUI, press **System, More, More, Security, Secure Erase All** and confirm.

Re-installation of Firmware Procedure (Non-secure Area)

1 Load the N8201A Series Firmware Update Program from the following Agilent Web site:

http://www.agilent.com/find/N8201A_firmware

2 At the menu screen, click on `Troubleshooting Wizard`, click on `Recovery`, then click `Next`.

3 Under "`The PC Update Program was Interrupted`," click `Next`. The "`Non-Functional Instrument Procedure`" will appear. Follow this procedure.

The Ethernet Number saved in the "Preliminary Procedure (Non-secure Area)" on page 506 becomes the hardware address when the hyphen is removed (i.e, Ethernet Number 001083-b80c55 becomes hardware address 001083b80c55). If you have access to this previously saved address, enabling the external keyboard step in the procedure can be skipped.

Enter the path for "Restore the Configuration and User Data" when prompted. (This path was noted in"Backing-up Configuration and Option License Keys to a PC (Non-secure Area)" on page 507.)

If a configuration back-up file is not available, obtain the License Key information saved in the "Preliminary Procedure (Non-secure Area)" on page 506. The option numbers listed in the License Key information allow you to determine which options were previously loaded in the instrument and allow you to check the appropriate boxes in the update program. The actual License Keys are needed to enable the options once the firmware is re-installed.

Service

These functions are used only for servicing the N8201A. A password is required to access them. Refer to the Service Guide for more information.

Key Path: System

Keyboard Lock (Remote Command Only)

Disables the instrument keyboard to prevent local input when the instrument is controlled remotely. An annunciator reading "Klock" alerts the local user that the keyboard is locked. Or you can display a system message using SYSTem:MESSage.

Remote Command:

```
:SYSTem:KLOCK?
```

Example:

```
SYST:KLOCK?
```

Remote Message

Enables a remote user to send a message that will appear in the Status Bar at bottom of the instrument display. The new message will overwrite any previous message. The message will remain until removed by use of `:SYSTem:MESSage:OFF`.

Example: `:SYSTem:MESSage "Instrument currently in use remotely by Ted in R+D"`

Remarks: The message appears as green text against a black background, to differentiate it from internally generated messages, which appear as white text against a black background.

The SYSTem:KLOCk command locks out the front-panel keys.

Remote Command:

```
:SYSTem:MESSage <string>
```

Example:

```
:SYSTem:MESSage "Instrument currently in use remotely by
Tom"
```

Remote Message Turned Off

Removes any system message from the Status Bar at the bottom of the instrument display. A message can be displayed using the `:SYSTem:MESSage` command.

Remote Command:

```
:SYSTem:MESSage:OFF
```

Example:

```
SYST:MESS:OFF
```

Power On Elapsed Time (Remote Command Only)

Returns the number of seconds that have elapsed since the instrument was turned on for the very first time.

Remote Command:

```
:SYSTem:PON:ETIMe?
```

Example:

```
SYST:PON:ETIM?
```

SCPI Version Query (Remote Command Only)

Returns the SCPI version number with which the instrument complies. The SCPI industry standard changes regularly. This command indicates the version used when creating the instrument SCPI commands.

Remote Command:

```
:SYSTem:VERSion?
```

Example:

```
SYST:VERS?
```

25 Trace/View

Displays menu keys that enable you to set how trace information is stored and displayed. Each trace is comprised of a series of data points in which x and y axis information is stored. The N8201A updates the information for the active trace with each sweep.

Key Path: Front-panel key

Factory Default:

Trace 1: Clear Write

Trace 2: Blank

Trace 3: Blank

Remote Command:

```
:TRACe[1]|2|3:MODE WRITe|MAXHold|MINHold|VIEW|BLANk
```

WRITe = Clear Write

MAXHold = Max Hold

MINHold = Min Hold

VIEW = View

BLANk = Blank

```
:TRACe[1]|2|3:MODE?
```

Example:

```
TRAC:MODE WRIT
TRAC:MODE MAXH
TRAC:MODE MINH
TRAC:MODE VIEW
TRAC:MODE BLANk
TRAC:MODE?
```

Send/Query Trace Data (Remote Command Only)

This command allows trace data to be sent to the N8201A or queried from the N8201A. The response to the query is a list of the amplitude points that comprise the requested trace in the current Y-axis unit of the N8201A. The X-axis unit is that of the destination trace for send and the source trace for the query.

The number of trace points sent or returned is set by `[:SENSE]:SWE:POIN` (from 101 to 8192).

Factory Preset: Real,32 for Spectrum Analysis mode

Remote Command:

```
:TRACe[:DATA] TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 |
TRACE6, <definite_length_block> |
<comma_separated_ASCII_data>
```

```
:TRACe[:DATA]? TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 |
TRACE6
```

Remote Command Notes:

The data format set by FORMat:DATA and FORMat:BORDer is used both for sending data to the instrument and receiving data from the instrument.

The `FORMat:DATA` command describes the different types of data formats that can be used with trace data. See “Format Numeric Data (Remote Command Only)" on page 173.

Use the `FORMat:BORDer` command to set the byte order. See “Set Data Byte Order (Remote Command Only)" on page 172.

Commands `:MMEM:STOR:TRAC` and `:MMEM:LOAD:TRAC` are used to transfer trace data to/from the internal hard drive of the instrument. See “Save Now" on page 150 and “Load Now" on page 156.)

When sending data to the instrument, the data block must contain exactly the number of points currently specified in Sweep, Points or the error “Invalid list data” will be generated and there will be no change to the target trace.

No units terminator (for example, dB or V) is used when sending data; the data is taken as being in the current Y-axis unit of the N8201A.

When a trace is sent to the instrument, it immediately overwrites all of the data in the target trace, even if that trace is in View, or if it is active and in the middle of a sweep.

Do *not* send a trace to the instrument or query trace data until Average or Max/Min Hold operations have been completed, or data will be misrepresented. It is generally advisable to be in Single Sweep, View or Blank when sending trace data to the N8201A or querying trace data from the N8201A.

If in the middle of a set of Average or Max/Min Hold operations, it can seriously invalidate the result, so you should exercise caution. Similarly, when querying trace data, it is best if the N8201A is not sweeping during the query. Therefore, it is generally advisable to be in Single Sweep, View or Blank when sending trace data to the N8201A or querying trace data from the N8201A.

Example:

`TRAC TRACE1,-1,-2,-3,-4,-5` sends five points to trace 1. Assuming that `FORMat:DATA` is set to ASCII, Y-axis unit is set to dBm, and Sweep, Points is set to 5, this will result in trace 1 consisting of the five points:

–1 dBm, –2 dBm, –3 dBm, –4 dBm, and –5 dBm.

`TRAC? TRACE2` queries the N8201A for the contents of trace 2.

Trace 1,2, or 3

Determines which trace the menu keys will affect.

Key Path: Trace/View

State Saved: Saved in Instrument State for all traces

Factory Preset: Trace 1 is active

Factory Default: Trace 1 is active

Remote Command:

There is no remote command for this function.

Clear Write

Erases any data previously stored in the selected trace and continuously displays signals during the sweep of the N8201A.

Key Path: Trace/View

Remote Command:

See "Trace/View" on page 511.

Example:

```
TRAC:MODE WRIT
```

Max Hold

Maintains the maximum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new maximum level is detected in successive sweeps.

Pressing Restart, changing the vertical scale (Amplitude, Scale Type, Log or Lin) or turning averaging on (BW/Avg, Average (On)) restarts the held trace.

Key Path: Trace/View

Remote Command:

See "Trace/View" on page 511.

Example:

```
TRAC:MODE MAXH
```

Min Hold

Maintains the minimum level for each trace point of the selected trace (1, 2 or 3), and updates each trace point if a new minimum level is detected in successive sweeps.

Pressing Restart, changing the vertical scale (Amplitude, Scale Type, Log or Lin) or turning averaging on (BW/Avg, Average (On)) restarts the held trace.

Key Path: Trace/View

Remote Command:

See "Trace/View" on page 511.

Example:

```
TRAC:MODE MINH
```

View

Holds and displays the amplitude data of the selected trace. The trace is not updated as the N8201A sweeps.

Key Path: Trace/View, Trace

Remote Command:

See "Trace/View" on page 511.

Example:

```
TRAC:MODE VIEW
```

Blank

Stores the amplitude data for the selected trace and removes it from the display. The selected trace register is not updated as the N8201A sweeps.

Key Path: Trace/View

Remote Command:

See "Trace/View" on page 511.

Example:

```
TRAC:MODE BLAN
```

Operations

This menu allows the user to do simple trace operations.

Key Path: Trace/View

1 <-> 2

Exchanges the contents of trace 1 with the contents of trace 2 and puts both in view mode. The action is performed once. It is not available for continuous sweeps. To clear any trace operation, set the trace back to Clear Write, Max Hold, or Min Hold.

The X-Axis settings and domain of a trace stay with it when it is copied or exchanged.

Key Path: Trace/View, Operations

Remote Command:

```
:TRACe:EXCHange: <trace_name>, <trace_name>
```

Example:

```
:TRAC:EXCH TRACE1,TRACE2
```

2 – DL -> 2

Subtracts the display line from trace 2 and places the result in trace 2. The action is performed once. It is not available for continuous sweeps. To keep the modified trace 2 from changing after the operation, it is set to View. To clear any trace operation, set the trace back to Clear Write, Max Hold, or Min Hold.

Key Path: Trace/View, Operations

Remote Command:

```
:TRACe:MATH:SUBTract:DLIN <trace_name>
```

Example:

```
TRAC:MATH:SUBT:DLIN TRACE2
```

2 <-> 3

Exchanges the contents of trace 2 with the contents of trace 3 and puts both in view mode. The action is performed once. It is not available for continuous sweeps. To keep the modified traces from changing after the operation, they are set to View. To clear any trace operation, set the trace back to Clear Write, Max Hold, or Min Hold.

The X-Axis settings and domain of a trace stay with it when it is copied or exchanged.

Key Path: Trace/View, Operations

Remote Command:

```
:TRACe:EXCHange: <trace_name>, <trace_name>
```

Example:

```
TRAC:EXCH TRACE2,TRACE3
```

1 -> 3

Copies the contents of trace 1 into the contents of trace 3 and puts trace 3 in blank mode. The action is performed once. It is not available for continuous sweeps. To clear any trace operation, set the trace back to Clear Write, Max Hold, or Min Hold.

The X-Axis settings and domain of a trace stay with it when it is copied or exchanged.

Key Path: Trace/View, Operations

Remote Command:

```
:TRACe:COPY <src_trace>,<dest_trace>
```

Example:

```
TRAC:COPY TRACE1,TRACE3
```

2 -> 3

Copies the contents of trace 2 into the contents of trace 3 and puts trace 3 in blank mode. The action is performed once. It is not available for continuous sweeps. To clear any trace operation, set the trace back to Clear Write, Max Hold, or Min Hold.

The X-Axis settings and domain of a trace stay with it when it is copied or exchanged.

Key Path: Trace/View, Operations

Remote Command:

```
:TRACe:COPY <src_trace>,<dest_trace>
```

Example:

```
TRAC:COPY TRACE2,TRACE3
```

Trace Addition (Remote Command Only)

This command adds the contents of any two traces, and puts the sum in any trace. The action is performed once. It is not available for continuous sweeps. All traces that are modified are set to View. To clear any trace operations, set the trace back to Clear Write, Max Hold, or Min Hold.

Remote Command:

```
:TRACe:MATH:ADD <dest_trace>,<src_trace>,<src_trace>
```

Example:

```
TRAC:MATH:ADD TRACE2,TRACE1,TRACE3
```

This command will add TRACE1 to TRACE3 and store it in TRACE2

Trace Subtraction (Remote Command Only)

This command adds the contents of any two traces, and puts the remainder in any trace. The action is performed once. It is not available for continuous sweeps. All traces modified are set to View. To clear any trace operation, set the trace back to Clear Write, Max Hold, or Min Hold.

Remote Command:

```
:TRACe:MATH:SUBTract <dest_trace>,<src_trace>,<src_trace>
```

Example:

```
TRAC:MATH:SUB TRACE2,TRACE1,TRACE3
```

This command will subtract TRACE3 from TRACE1 and store it in TRACE2

Trace Mean (Remote Command Only)

This command finds the mean of the amplitude of all the points on a trace and is returned as a single value in the current amplitude units.

Remote Command:

```
:TRACe:MATH:MEAN? <src_trace>
```

Example:

```
TRAC:MATH:MEAN TRACE2
```

Normalize

Displays menu keys that enable you to normalize trace data.

Key Path: Trace/View

Store Ref (1 –> 3)

Copies trace 1 into trace 3. Store Ref (1 –> 3) must be pressed before pressing Normalize (On). This puts trace 3 in view mode.

Key Path: Trace/View, Normalize

Remote Command:

There is no remote command for this function, however the trace copy command can be used for this purpose.

Example:

```
TRAC:COPY TRACE1,TRACE3
```

Normalize On/Off

On each sweep, the normalized trace (trace 1) is subtracted from trace 3 and the result is added to the normalized reference level. The display shows the result of the following calculation in trace 1. This determines the location of the trace on the display, *not* the marker reading.

Trace 1 – Reference Trace – Normalized Reference Level

where trace 1 and the reference trace are in absolute units and the reference level is in relative units.

The new trace 1 is normalized with respect to the normalized reference level and reference trace, even if the values of the normalized reference level or reference are changed. This function remains in effect on all subsequent sweeps until it is turned off.

The normalize function is most useful for applying correction data to a trace while making a stimulus-response measurement with a tracking source.

For example,

1 Connect the cables and a through line in place of the device to be measured (between the tracking source and the N8201A input).

  Notice that the frequency response is not perfectly flat, showing the response of the cables, as well as the flatness of both the tracking generator and the N8201A.

2 Press **Store Ref (1 -> 3), Normalize On**.

Notice that the displayed trace is now flat, or normalized.

3 The position of the normalized trace can now be moved to a different position on the display by changing the normalized reference position.

This may be useful if the device to be tested has positive gain, such as an amplifier. Now, replace the through line with the DUT and an accurate measurement of the gain or loss can be made.

Key Path: Trace/View, Normalize

Dependencies/Couplings:

- When Normalize is turned on, Volts, Watts, Amps, and Scale Type are not available.
- If Scale Type is Linear, Normalize is not available.

State Saved: Saved in Instrument State.

Remote Command:

```
:CALCulate:NTData[:STATe] OFF|ON|0|1
:CALCulate:NTData[:STATe]?
```

Example:

```
CALC:NTD ON
CALC:NTD?
```

Norm Ref Lvl

Sets the level (in dB) of the normalized reference.

Key Path: Trace/View, Normalize

Factory Default: 0 dB

State Saved: Saved in Instrument State.

Range: – 327.6 dB to +327.6 dB

Remote Command

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:NRLevel <rel_ampl>
:DISPlay:WINDow:TRACe:Y[:SCALe]:NRLevel?
```

Example:

```
DISP:WIND:TRAC:Y:NRL .10 dB
```

```
DISP:WIND:TRAC:Y:NRL?
```

Norm Ref Posn

Offsets the displayed trace without affecting the instrument gain or attenuation settings. This allows the displayed trace to be moved without decreasing measurement accuracy. The normalized reference position is indicated with a (>) character on the left side of the display and a (<) character on the right side of the display, just inside the graticule.

Key Path: Trace/View, Normalize

State Saved: Saved in Instrument State.

Factory Preset: 10

Factory Default 10

Range: 0 to 10

Remote Command:

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:NRPosition <integer>
```

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:NRPosition?
```

Remote Command Notes:

The top and bottom graticule lines correspond to 10 and 0, respectively

Remote Command Example:

```
DISP:WIND:TRAC:Y:NRP 5
```

```
DISP:WIND:TRAC:Y:NRP?
```

Ref Trace (Trace 3)

Views or blanks the reference trace on the display. The reference trace is trace 3, so this is the same as setting trace 3's display attribute.

Key Path: Trace/View, Normalize

State Saved: Saved in Instrument State.

Remote Command:

Use the `:TRACe:MODE` command to show or blank the reference trace.

Remote Command Notes:

Trace 3 is always the reference trace by definition.

Remote Command Example:

`TRAC3:DISP 1` shows the reference trace.

26 Trig

Displays menu keys that enable you to select the trigger mode of a sweep or measurement. When in a trigger mode other than Free Run, the N8201A will begin a sweep only with the proper trigger condition.

In FFT measurements, the trigger controls when the data is acquired for FFT conversion; see "Tip: Making Gated FFT Measurements" on page 78.

Key Path: Front-panel key

State Saved: Saved in Instrument State

Factory Preset: Free Run

Remote Command:

```
:TRIGger[:SEQuence]:SOURce
IMMediate|VIDeo|LINE|EXTernal[1]|EXTernal2|RFBurst
```

```
:TRIGger[:SEQuence]:SOURce?
```

- IMM = Free Run triggering
- VID = Video – Triggers on the video signal level
- LINE = Line – Triggers on the power line signal
- Ext1 = External Front – Enables you to trigger on an externally connected trigger source
- Ext2 = External Rear – Enables you to trigger on an externally connected trigger source

Remote Command Notes:

Other trigger-related commands are found in the INITiate and ABORt subsystems.

Example:

```
TRIG:SOUR VID
```

Free Run

Sets the trigger to start a new sweep/measurement as soon as the last one has ended (continuous sweep mode) or immediately (single sweep mode).

Key Path: Trig

Dependencies/Couplings: Trigger Slope and Delay adjustments are not available with Free Run triggering.

Remote Command:

See "Trig" on page 527

Example:

```
TRIG:SOUR IMM
```

Video

Activates the trigger condition that allows the next sweep to start if the detected RF envelope voltage crosses a level set by the video trigger level. When Video is pressed, a line appears on the display. The N8201A triggers when the input signal exceeds the trigger level at the left edge of the display. You can change the trigger level using the key pad or the scroll keys. The line remains as long as video trigger is the trigger type.

Key Path: Trig

Dependencies/Couplings: Trigger Delay adjustment is not available with Video triggering.

Video triggering is not available when the detector type is Average. Marker Functions that set the detector to average (such as Marker Noise or Band/Intvl Power) are not available when the video trigger is on.

This function is not available when the Resolution Bandwidth is less than 1 kHz. If a Resolution Bandwidth less than 1 kHz is selected while in Video Trigger mode, the Trigger mode changes to Free Run.

Factory Preset: –25 dBm

Range:

Using *logarithmic scale*: from 10 display divisions below the reference level, up to the reference level.

Using *linear scale*: from 100 dB below the reference level, up to the reference level.

For more information, see"Scale Type" on page 50.

Remote Command:

See "Trig" on page 527 for the command that sets trigger mode. The following commands set or read the trigger level.

`:TRIGger[:SEQuence]:VIDeo:LEVel <ampl>`

`:TRIGger[:SEQuence]:VIDeo:LEVel?`

`:TRIGger[:SEQuence]:VIDeo:LEVel:FREQuency <freq>` sets the Video Trigger level when in FM Demod, and Demod View is on

`:TRIGger[:SEQuence]:VIDeo:LEVel:FREQuency?`

Example:

`TRIG:SOUR VID` selects video triggering.

Line

Sets the trigger to start a new sweep or measurement to be synchronized with the next cycle of the line voltage.

Key Path: Trig

Couplings/Dependencies: Line trigger is not available when operating from a dc power source.

Remote Command: See "Trig" on page 527.

Example:

`TRIG:SOUR LINE` selects line triggering.

Trigger In

Sets the trigger to start a new sweep or measurement whenever the external voltage (connected to EXT TRIGGER INPUT on the front panel) passes through approximately 1.5 volts.

Key Path: Trig

State Saved: Saved in Instrument State

Factory Preset: 1.5 V

Remote Command:

See "Trig" on page 527.

Example:

`TRIG:SOUR EXT` to select front panel external triggering.

Ext Rear (Trigger In)

NOTE This function is not available on the N8201A.

RF Burst (Wideband)

Allows the N8201A to be triggered by an RF burst envelope signal.

Key Path: Trig

Remote Command:

See "Trig" on page 527.

Example:

```
TRIG:SOUR RFB
```

Trig Slope

Controls the trigger polarity. Set to positive to trigger on a rising edge. Set to negative to trigger on a falling edge.

Key Path: Trig

Dependencies/Couplings: Not available for Free Run.

State Saved: Saved in Instrument State.

Factory Preset: Positive (rising edge)

Remote Command:

```
:TRIGger[:SEQuence]:SLOPe POSitive|NEGative
```

```
:TRIGger[:SEQuence]:SLOPe?
```

Example:

```
TRIG:SLOP NEG
```

Trig Delay

Allows you to control a time delay during which the N8201A will wait to begin a sweep after receiving an external or line trigger signal. You can use negative delay to pre-trigger the instrument.

Trigger Delay is not available in Free Run, so turning Free Run on turns off Trigger Delay, but preserves the value of Trigger Delay.

Key Path: Trig

Dependencies/Couplings:

- This function is not available when Trigger is Free Run or Video.
- This function is not available when Gate is on.

State Saved: Saved in Instrument State.

Factory Preset: Off, 1 µs

Range: –150 ms to +500 ms

Remote Command:

```
:TRIGger[:SEQuence]:DELay <time>
:TRIGger[:SEQuence]:DELay?
:TRIGger[:SEQuence]:DELay:STATe OFF|ON|0|1
:TRIGger[:SEQuence]:DELay:STATe?
```

Example:

```
TRIG:DEL:STAT ON
TRIG:DEL 100 ms
```

Trig Offset (Remote Command Only)

This command sets the trigger offset. Trigger offset refers to the specified time interval before or after the trigger event from which data is to be written to the trace, and then displayed. Ordinarily, the trigger offset value is zero, and trace data is displayed beginning at the trigger event. A negative trigger offset value results in the display of trace data prior to the trigger event. A positive trigger offset value results in an effective delay in the display of trace data after the trigger event.

The trigger offset value used when the feature is enabled depends on the following parameters:

- Nominal trigger offset value originally entered
- Specific instrument hardware in use
- Sweep time
- Number of sweep points

The effective trigger offset value are recalculated whenever any of these parameters change.

State Saved: Saved in Instrument State.

Factory Preset: 0 – 500 ms

Range: Hardware specific; dependent upon the ADC being used, current state and the number of sweep points.

Remote Command:

```
:TRIGger[:SEQuence]:OFFSet <time>
:TRIGger[:SEQuence]:OFFSet?
:TRIGger[:SEQuence]:OFFSet:STATe OFF|ON|0|1
:TRIGger[:SEQuence]:OFFSet:STATe?
```

Remote Command Notes:

Trigger offset can only be turned on when in zero span and the resolution bandwidth is 1 kHz or greater. Trigger offset is available for all trigger modes.

Example:

`TRIG:OFFS 100 ms`

`TRIG:OFFS:STAT ON` turns on the trigger offset.

27
Using the STATus System

When you are programming the instrument you may need to monitor instrument status to check for error conditions or monitor changes. You can determine the state of certain instrument events or conditions by programming the status register system. IEEE common commands (those beginning with *) access the higher-level summary registers. To access the information from specific registers, you would use the STATus commands.

Status System Commands

The chapter includes:

- A description of the status registers and their hierarchy
- Instructions on using the registers and commands
- Complete descriptions of the commands

\

IEEE (*) Commands	
*CAL?	Calibration Query
*CLS	Clear Status
*ESE <number>, *ESE?	Standard Event Status Enable
*ESR?	Standard Event Status Register Query
*IDN?	Identification Query
*OPC	Operation Complete Command
*OPC?	Operation Complete Query
*OPT?	Option Information Query
*RCL <register>	Recall Instrument State
*RST	Reset the Instrument
*PSC, *PSC?	Power-on Status Complete
*SAV <register>	Save Instrument State
*SRE <number>, *SRE?	Service Request Enable
*STB?	Read Status Byte Query
*TRG	Trigger a Sweep/Measurement
*TST?	Self-test Query
*WAI	Wait-to-Continue

STATus Commands	
Operation Registers	STATus:OPERation:<keyword>
	Operation Condition Query
	Operation Enable
	Operation Event Query
	Operation Negative Transition

STATus Commands	
	Operation Positive Transition
Preset the Status Bytes	STATus:PRESet
Status Registers	STATus:QUEStionable:<keyword>
	Questionable Condition
	Questionable Enable
	Questionable Event Query
	Questionable Negative Transition
	Questionable Positive Transition
Calibration Registers	STATus:QUEStionable:CALibration:<keyword>
	Questionable Calibration Condition
	Questionable Calibration Enable
	Questionable Calibration Event Query
	Questionable Calibration Negative Transition
	Questionable Calibration Positive Transition
Frequency Registers	STATus:QUEStionable:FREQuency:<keyword>
	Questionable Frequency Condition
	Questionable Integrity Enable
	Questionable Frequency Event Query
	Questionable Frequency Negative Transition
	Questionable Frequency Positive Transition
Integrity Registers	STATus:QUEStionable:INTegrity:<keyword>
	Questionable Integrity Condition
	Questionable Integrity Event Query
	Questionable Integrity Event Query
	Questionable Integrity Negative Transition
	Questionable Integrity Positive Transition
Signal Integrity Registers	STATus:QUEStionable:INTegrity:SIGNal:<keyword>
	Questionable Integrity Signal Condition
	Questionable Integrity Signal Enable
	Questionable Integrity Signal Event Query
	Questionable Integrity Signal Negative Transition

STATus Commands	
	Questionable Integrity Signal Positive Transition
Calibration Integrity Registers	STATus:QUEStionable:INTegrity:UNCalibrated:<keyword>
	Questionable Calibration Integrity Condition
	Questionable Calibration Integrity Enable
	Questionable Calibration Integrity Event Query
	Questionable Calibration Integrity Negative Transition
	Questionable Calibration Integrity Positive Transition
Power Registers	STATus:QUEStionable:POWer:<keyword>
	Questionable Power Condition
	Questionable Power Enable
	Questionable Power Event Query
	Questionable Power Negative Transition
	Questionable Power Positive Transition
Temperature Registers	STATus:QUEStionable:TEMPerature:<keyword>
	Questionable Temperature Condition
	Questionable Temperature Enable
	Questionable Temperature Event Query
	Questionable Temperature Negative Transition
	Questionable Temperature Positive Transition

Using the Status Registers

The Section "N8201A Core Status Register System (Page 2 of 2)" on page 547 shows the N8201A instrument status registers and their hierarchy.

"What Status Registers Are" on page 541

"How to Use the Status Registers" on page 542

"Using a Status Register" on page 544

"Using the Service Request (SRQ) Method" on page 544

"N8201A Core Status Register System (Page 2 of 2)" on page 547

"Standard Event Status Register" on page 551

"Operation and Questionable Status Registers" on page 553

What Status Registers Are

The status system is comprised of multiple registers that are arranged in a hierarchical order. The lower-level status registers propagate their data to the higher-level registers in the data structures by means of summary bits. The status byte register is at the top of the hierarchy and contains general status information for the instrument's events and conditions. All other individual registers are used to determine the specific events or conditions.

The operation and questionable status registers are sets of registers that monitor the overall instrument condition. They are accessed with the STATus:OPERation and STATus:QUEStionable commands in the STATus command subsystem. Each register set is made up of five registers:

Condition Register reports the real-time state of the signals monitored by this register set. There is no latching or buffering for a condition register.

Positive Transition Register this filter register controls which signals will set a bit in the event register when the signal makes a low to high transition (when the condition bit changes from 0 to 1).

Negative Transition Register this filter register controls which signals will set a bit in the event register when the signal makes a high to low transition (when the condition bit changes from 1 to 0).

Event Register latches any signal state changes, in the way specified by the filter registers. Bits in the event register are never cleared by signal state changes. Event registers are cleared when read. They are also cleared by *CLS and by presetting the instrument.

Event Enable Register controls which of the bits, being set in the event register, will be summarized as a single output for the register set. Summary bits are then used by the next higher register.

The STATus:QUEStionable registers report abnormal operating conditions. The status register hierarchy is:

1 The summary outputs from the six STATus:QUEStionable:<keyword> detail registers are inputs to the STATus:QUEStionable register.

2 The summary output from the STATus:QUEStionable register is an input to the Status Byte Register. See the Section "N8201A Core Status Register System (Page 2 of 2)" on page 547.

The STATus:OPERation register set has no summarized inputs. The inputs to the STATus:OPERation:CONDition register indicate the real time state of the instrument. The STATus:OPERation:EVENt register summary output is an input to the Status Byte Register.

What Are Status Register SCPI Commands?

Most monitoring of the instrument conditions is done at the highest level using the IEEE common commands indicated below. Complete command descriptions are available in the IEEE commands section at the beginning of the language reference. Individual status registers can be set and queried using the commands in the STATus subsystem of the language reference.

- *CLS (clear status) clears the status byte by emptying the error queue and clearing all the event registers.
- *ESE, *ESE? (event status enable) sets and queries the bits in the enable register part of the standard event status register.
- *ESR? (event status register) queries and clears the event register part of the standard event status register.
- *OPC, *OPC? (operation complete) sets the standard event status register to monitor the completion of all commands. The query stops any new commands from being processed until the current processing is complete, then returns a '1'.
- *PSC, *PSC? (power-on state clear) sets the power-on state so that it clears the service request enable register and the event status enable register at power on.
- *SRE, *SRE? (service request enable) sets and queries the value of the service request enable register.
- *STB? (status byte) queries the value of the status byte register without erasing its contents.

How to Use the Status Registers

A program often needs to be able to detect and manage error conditions or changes in instrument status. There are two methods you can use to programmatically access the information in status registers:

- The polling method

- The service request (SRQ) method

In the polling method, the instrument has a passive role. It only tells the controller that conditions have changed when the controller asks the right question. In the SRQ method, the instrument takes a more active role. It tells the controller when there has been a condition change without the controller asking. Either method allows you to monitor one or more conditions.

The polling method works well if you do not need to know about changes the moment they occur. The SRQ method should be used if you must know immediately when a condition changes. To detect a change using the polling method, the program must repeatedly read the registers.

Use the SRQ method when:

- you need time-critical notification of changes
- you are monitoring more than one device which supports SRQs
- you need to have the controller do something else while waiting
- you can not afford the performance penalty inherent to polling

Use polling when:

- your programming language/development environment does not support SRQ interrupts
- you want to write a simple, single-purpose program and do not want the added complexity of setting up an SRQ handler

To monitor a condition:

1 Determine which register contains the bit that reports the condition.

2 Send the unique SCPI query that reads that register.

3 Examine the bit to see if the condition has changed.

You can monitor conditions in different ways.

- Check the current instrument hardware and firmware status.

  Do this by querying the condition registers which continuously monitor status. These registers represent the current state of the instrument. Bits in a condition register are updated in real time. When the condition monitored by a particular bit becomes true, the bit is set to 1. When the condition becomes false, the bit is reset to 0.

- Monitor a particular condition (bit).

You can enable a particular bit(s), using the event enable register. The instrument will then monitor that particular condition(s). If the bit becomes true (0 to 1 transition) in the event register, it will stay set until the event register is cleared. Querying the event register allows you to detect that this condition occurred even if the condition no longer exists. The event register can only be cleared by querying it or sending the *CLS command.

- Monitor a particular type of change in a condition (bit).

- The transition registers are preset to register if the condition goes from 0 to 1 (false to true, or a positive transition).
- This can be changed so the selected condition is detected if the bit goes from 1 to 0 (true to false, or a negative transition).
- It can also be set for both types of transitions occurring.
- Or it can be set for neither transition. If both transition registers are set to 0 for a particular bit position, that bit will not be set in the event register for either type of change.

Using a Status Register

Each bit in a register is represented by a numerical value based on its location. See Figure 10 below. This number is sent with the command to enable a particular bit. If you want to enable more than one bit, you would send the sum of all the bits that you want to monitor.

For example, to enable bit 0 and bit 6 of standard event status register, you would send the command `*ESE 65` because 1 + 64 = 65.

The results of a query are evaluated in a similar way. If the `*STB?` command returns a decimal value of 140, (140 = 128 + 8 + 4) then bit 7 is true, bit 3 is true and bit 2 is true.

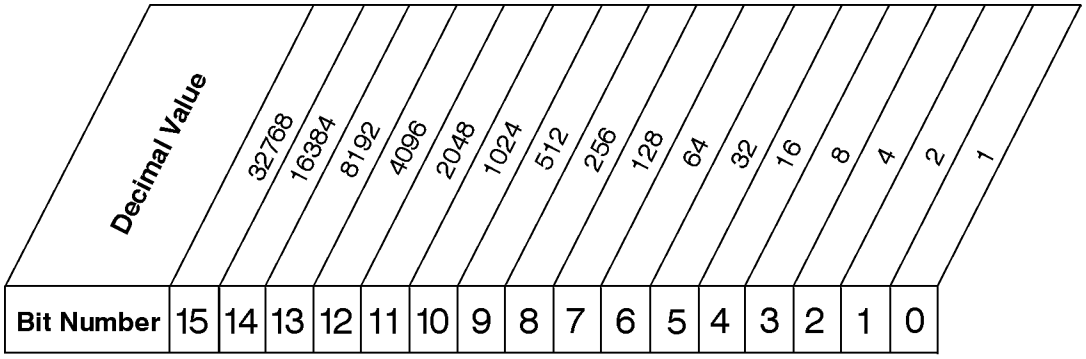


Figure 10 Status Register Bit Values

Using the Service Request (SRQ) Method

Your language, bus and programming environment must be able to support SRQ interrupts. (For example, BASIC used with the GPIB.) SRQ is available on SICL LAN. When you monitor a condition with the SRQ method, you must:

1. Determine which bit monitors the condition.
2. Determine how that bit reports to the request service (RQS) bit of the status byte.
3. Send GPIB commands to enable the bit that monitors the condition and to enable the summary bits that report the condition to the RQS bit.

4 Enable the controller to respond to service requests.

When the condition changes, the instrument sets its RQS bit and the GPIB SRQ line. The controller is informed of the change as soon as it occurs. As a result, the time the controller would otherwise have used to monitor the condition can be used to perform other tasks. Your program determines how the controller responds to the SRQ.

Generating a Service Request

To use the SRQ method, you must understand how service requests are generated. Bit 6 of the status byte register is the request service (RQS) bit. The `*SRE` command is used to configure the RQS bit to report changes in instrument status. When such a change occurs, the RQS bit is set. It is cleared when the status byte register is queried using `*SRE?` (with a serial poll.) It can be queried without erasing the contents with `*STB?`.

When a register set causes a summary bit in the status byte to change from 0 to 1, the instrument can initiate the service request (SRQ) process. However, the process is only initiated if both of the following conditions are true:

- The corresponding bit of the service request enable register is also set to 1.
- The instrument does not have a service request pending. (A service request is considered to be pending between the time the instrument's SRQ process is initiated and the time the controller reads the status byte register.)

The SRQ process sets the GPIB SRQ line true. It also sets the status byte's request service (RQS) bit to 1. Both actions are necessary to inform the controller that the instrument requires service. Setting the SRQ line only informs the controller that some device on the bus requires service. Setting the RQS bit allows the controller to determine which instrument requires service.

If your program enables the controller to detect and respond to service requests, it should instruct the controller to perform a serial poll when the GPIB SRQ line is set true. Each device on the bus returns the contents of its status byte register in response to this poll. The device whose RQS bit is set to 1 is the device that requested service.

When you read the instrument's status byte register with a serial poll, the RQS bit is reset to 0. Other bits in the register are not affected.

If the status register is configured to SRQ on end-of-measurement and the measurement is in continuous mode, then restarting a measurement (INIT command) can cause the measuring bit to pulse low. This causes an SRQ when you have not actually reached the "end-of-measurement" condition. To avoid this:

1 Set `INITiate:CONTinuous` off.

2 Set/enable the status registers.

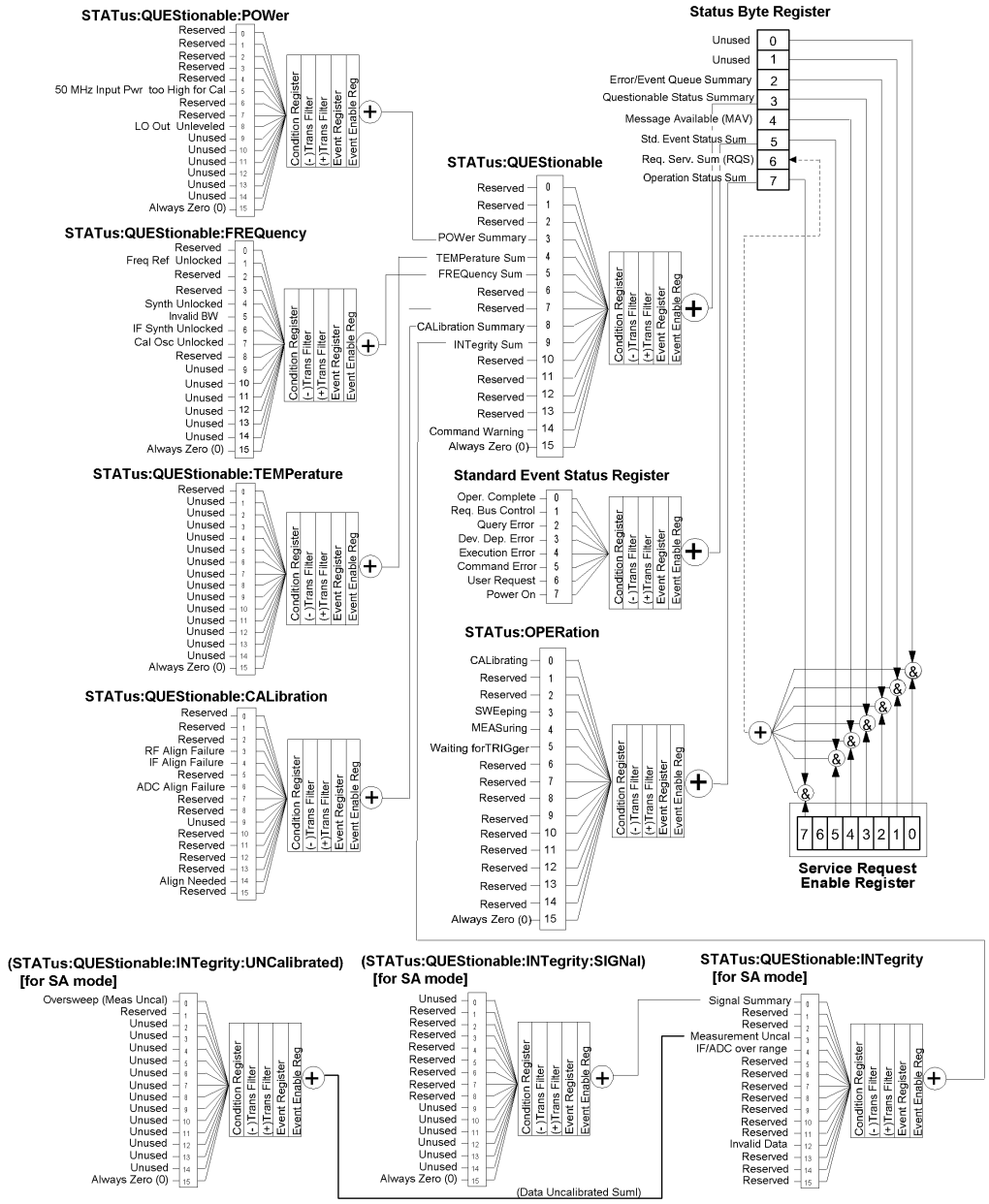
3 Restart the measurement (send `INIT`).

Core Status Register System (Page 1 of 2)

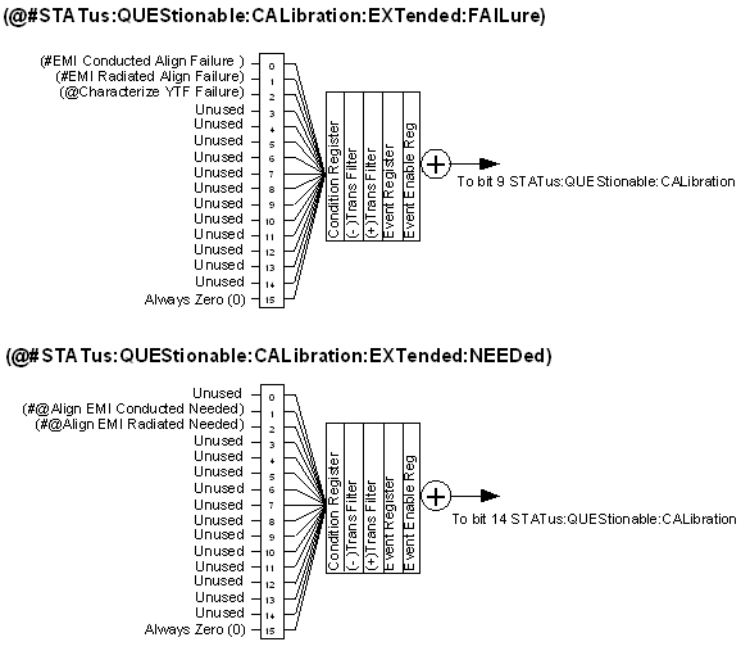
Preset Values

For All Registers: (-) Transition Filter = 0's
(+) Transion Filter = 1's
For STAT:QUES, STAT:OPER, & all OPER:INST:ISUM registers: Event Enable = 0's
For all Other Registers: Event Enable = 1's

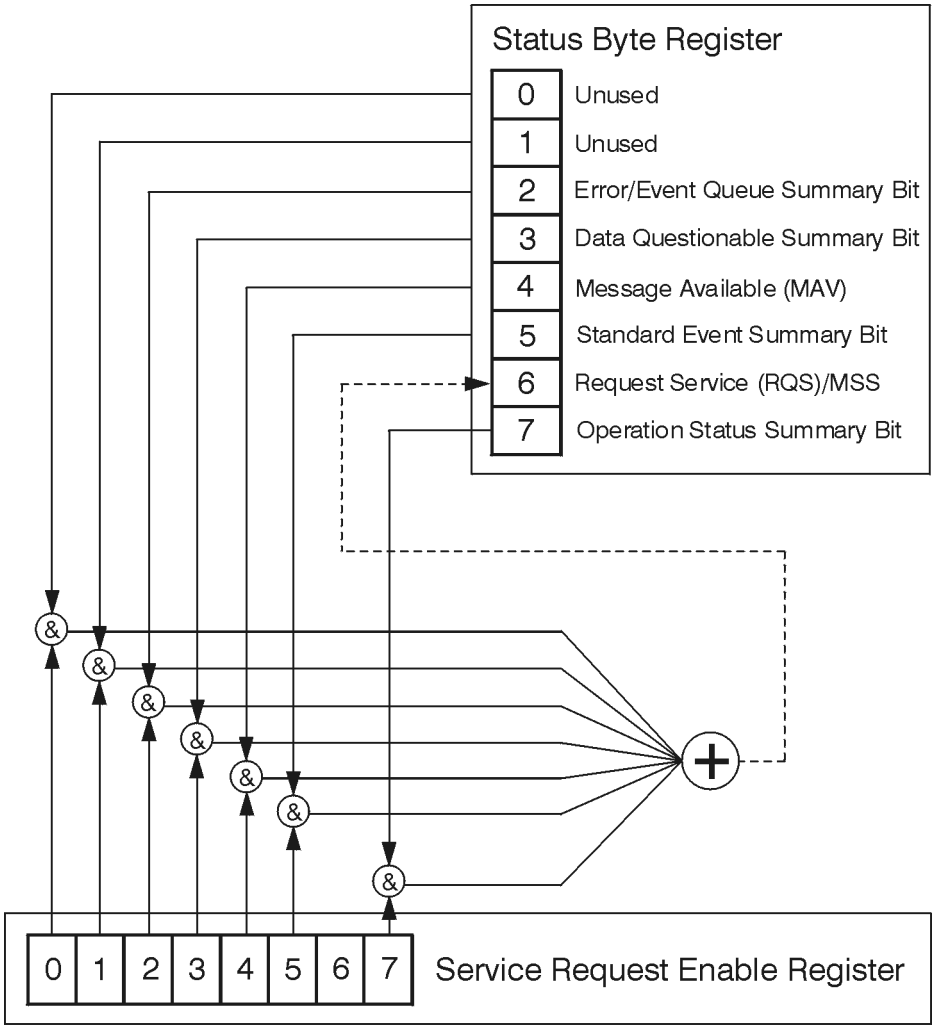
Unused: All unused bits = 0



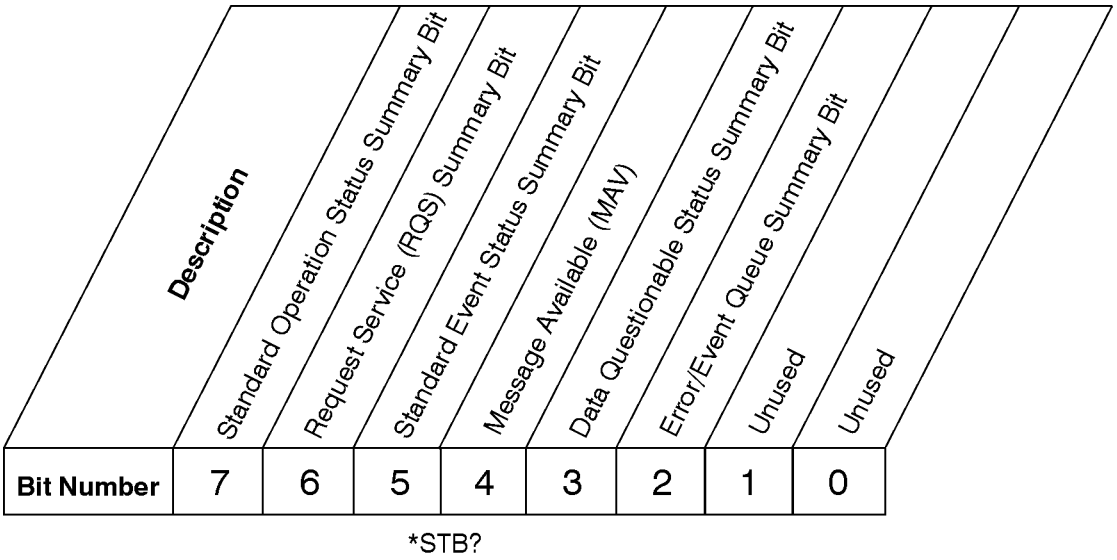
N8201A Core Status Register System (Page 2 of 2)



Status Byte Register



The RQS bit is read and reset by a serial poll. The same bit position (MSS) is read, nondestructively by the *STB? command. If you serial poll bit 6 it is read as RQS, but if you send `*STB` it reads bit 6 as MSS. For more information refer to IEEE 488.2 standards, section 11.



*STB?

Status Byte Register

ck725a

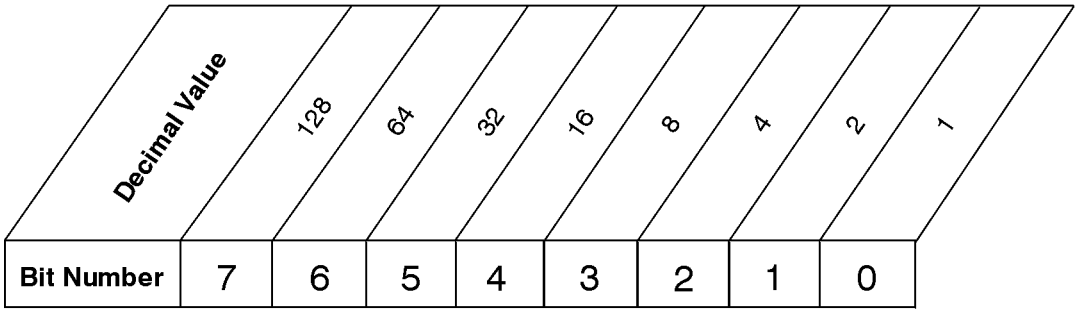
Bit	Description
0, 1	These bits are always set to 0.
2	A 1 in this bit position indicates that the SCPI error queue is not empty which means that it contains at least one error message.
3	A 1 in this bit position indicates that the data questionable summary bit has been set. The data questionable event register can then be read to determine the specific condition that caused this bit to be set.
4	A 1 in this bit position indicates that the instrument has data ready in the output queue. There are no lower status groups that provide input to this bit.
5	A 1 in this bit position indicates that the standard event summary bit has been set. The standard event status register can then be read to determine the specific event that caused this bit to be set.
6	A 1 in this bit position indicates that the instrument has at least one reason to report a status change. This bit is also called the master summary status bit (MSS).
7	A 1 in this bit position indicates that the standard operation summary bit has been set. The standard operation event register can then be read to determine the specific condition that caused this bit to be set.

To query the status byte register, send the command `*STB?` The response will be the *decimal* sum of the bits which are set to 1. For example, if bit number 7 and bit number 3 are set to 1, the decimal sum of the 2 bits is 128 plus 8. So the decimal value 136 is returned. The `*STB` command does not clear the status register

In addition to the status byte register, the status byte group also contains the service request enable register. This register lets you choose which bits in the status byte register will trigger a service request.

Send the `*SRE <number>` command where `<number>` is the sum of the decimal values of the bits you want to enable plus the decimal value of bit 6. For example, assume that you want to enable bit 7 so that whenever the standard operation status register summary bit is set to 1 it will trigger a service request. Send the command `*SRE 192` (because 192 = 128 + 64). You must always add 64 (the numeric value of RQS bit 6) to your numeric sum when you enable any bits for a service request. The command `*SRE?` returns the decimal value of the sum of the bits previously enabled with the `*SRE <number>` command.

The service request enable register presets to zeros (0).

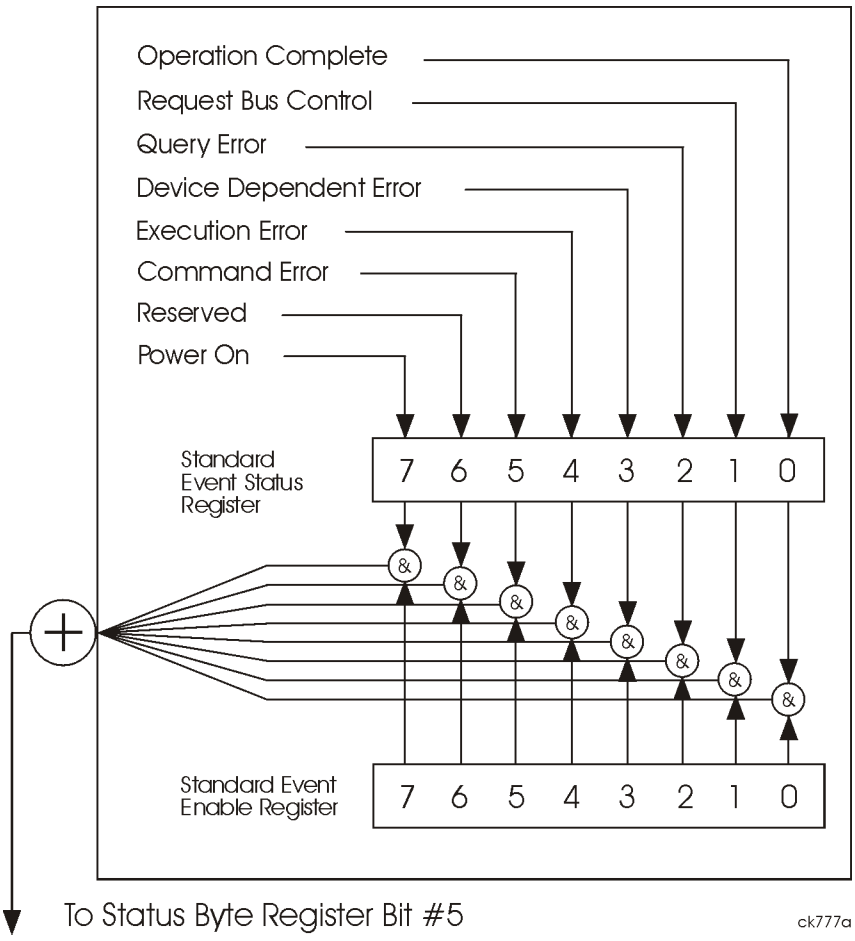


*SRE <num>
*SRE?

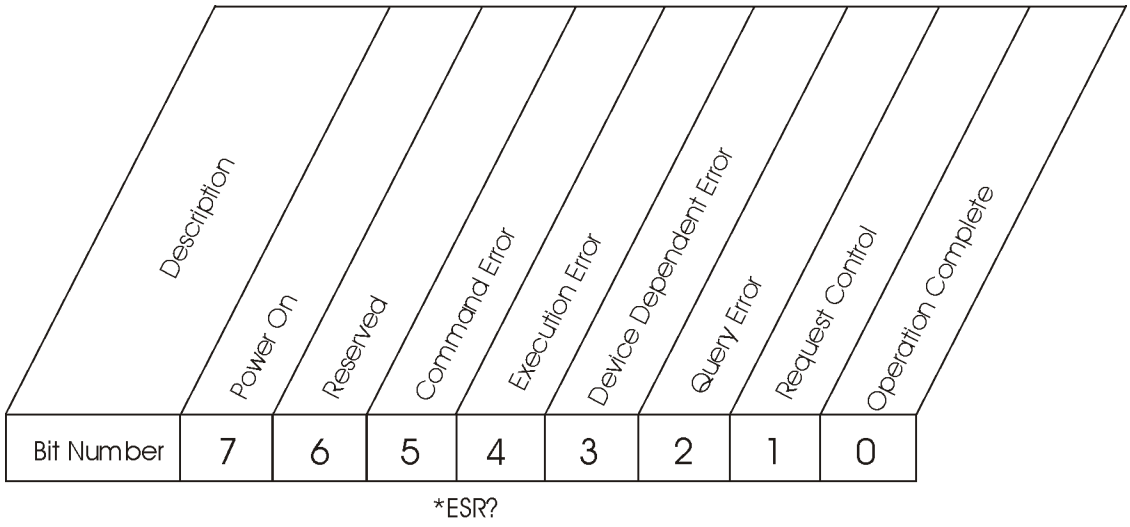
Service Request Enable Register

ck726a

Standard Event Status Register



The standard event status register contains the following bits:



Standard Event Status Register

ck727a

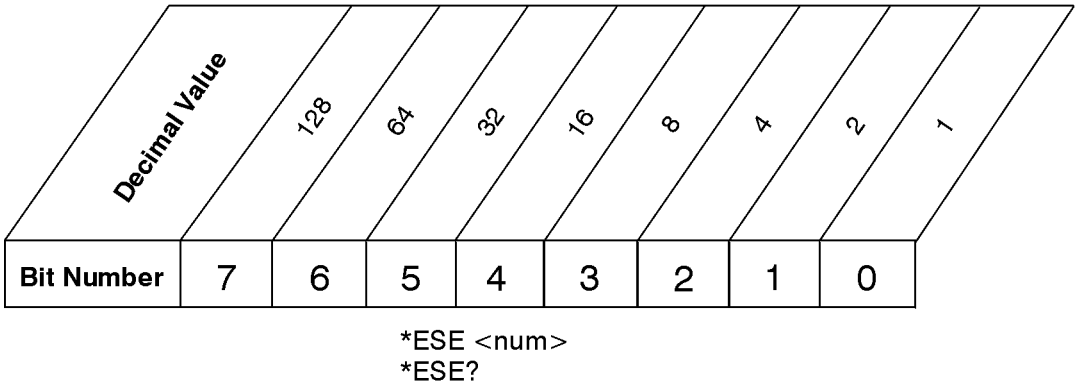
Bit	Description
0	A 1 in this bit position indicates that all pending operations were completed following execution of the *OPC command.
1	This bit is always set to 0. (The instrument does not request control.)
2	A 1 in this bit position indicates that a query error has occurred. Query errors have SCPI error numbers from –499 to –400.
3	A 1 in this bit position indicates that a device dependent error has occurred. Device dependent errors have SCPI error numbers from –399 to –300 and 1 to 32767.
4	A 1 in this bit position indicates that an execution error has occurred. Execution errors have SCPI error numbers from –299 to –200.
5	A 1 in this bit position indicates that a command error has occurred. Command errors have SCPI error numbers from –199 to –100.
6	Reserved
7	A 1 in this bit position indicates that the instrument has been turned off and then on.

The standard event status register is used to determine the specific event that set bit 5 in the status byte register. To query the standard event status register, send the command *ESR?. The response will be the *decimal* sum of the bits which are enabled (set to 1). For example, if bit number 7 and bit number 3 are enabled, the decimal sum of the 2 bits is 128 plus 8. So the decimal value 136 is returned.

In addition to the standard event status register, the standard event status group also contains a standard event status enable register. This register lets you choose which bits in the standard event status register will set the summary bit (bit 5 of the status byte register) to 1. Send the *ESE <number> command where <number> is the sum of the decimal

values of the bits you want to enable. For example, to enable bit 7 and bit 4 so that whenever either of those bits is set to 1, the standard event status summary bit of the status byte register will be set to 1, send the command `*ESE 144` (128 + 16). The command `*ESE?` returns the decimal value of the sum of the bits previously enabled with the `*ESE <number>` command.

The standard event status enable register presets to zeros (0).



Standard Event Status Enable Register ck728a

Operation and Questionable Status Registers

The operation and questionable status registers are registers that monitor the overall instrument condition. They are accessed with the STATus:OPERation and STATus:QUEStionable commands in the STATus command subsystem. See the Section "N8201A Core Status Register System (Page 2 of 2)" on page 547.

Operation Status Register

The operation status register monitors the current instrument measurement state. It checks to see if the instrument is calibrating, sweeping, or waiting for a trigger. For more information see the *OPC? command located in the IEEE Common Commands section.

Bit	Condition	Operation
0	Calibrating	The instrument is busy executing its automatic alignment process.
3	Sweeping	The instrument is busy taking a sweep.
5	Waiting for trigger	The instrument is waiting for the trigger conditions to be met, then it will trigger a sweep or measurement.

Questionable Status Register

The questionable status register monitors the instrument's condition to see if anything problematic has happened to it. It is looking for anything that might cause an error or a bad measurement like a hardware problem, an out of calibration situation, or a unusual signal. All the bits are summary bits from lower-level event registers.

Bit	Condition	Operation
3	Power summary	The instrument hardware has detected a power unleveled condition.
4	Temperature summary	The instrument is still warming up.
5	Frequency summary	The instrument hardware has detected an unlocked condition or a problem with the external frequency reference.
8	Calibration summary	The instrument has detected a hardware problem while doing the automatic internal alignment process.
9	Integrity summary	The instrument has detected a questionable measurement condition such as: bad timing, bad signal/data, timeout problem, signal overload, or "meas uncal".

Using the STATus System IEEE Commands

These commands are specified in IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols and Common Commands for Use with ANSI/IEEE Std 488.1-1987*. New York, NY, 1992.

Numeric values for bit patterns can be entered using decimal or hexadecimal representations. (that is, 0 to 32767 is equivalent to #H0 to #H7FFF) See the SCPI Basics information about using bit patterns for variable parameters.

Calibration Query

```
*CAL?
```

Performs a full alignment and returns a number indicating the success of the alignment. A 0 is returned if the alignment is successful. A 1 is returned if any part of the alignment fails. The equivalent SCPI command is `CALibrate[:ALL]?`

Front Panel Access: System, Alignments, Align All Now

Clear Status

```
*CLS
```

Clears the status byte. It does this by emptying the error queue and clearing all bits in all of the event registers. The status byte registers summarize the states of the other registers. It is also responsible for generating service requests.

Key Type: There is no equivalent front-panel key.

Standard Event Status Enable

```
*ESE <number>
```

```
*ESE?
```

Selects the desired bits from the standard event status enable register. This register monitors I/O errors and synchronization conditions such as operation complete, request control, query error, device dependent error, execution error, command error and power on. The selected bits are ORed to become a summary bit (bit 5) in the status byte register which can be queried.

The query returns the state of the standard event status enable register.

Key Type: There is no equivalent front-panel key.

Range: Integer, 0 to 255

Standard Event Status Register Query

```
*ESR?
```

Queries and clears the standard event status event register. (This is a destructive read.)

Key Type: There is no equivalent front-panel key.

Range: Integer, 0 to 255

Identification Query

```
*IDN?
```

Returns an instrument identification information. The string will contain the model number, serial number and firmware revision.

The response is organized into four fields separated by commas. The field definitions are as follows:

- Manufacturer
- Model
- Serial number
- Firmware version

For example:

```
Agilent Technologies,N8201A,US00000123,A.09.14
```

Key Type: There is no equivalent front-panel key.

Remarks: An @ in the firmware revision information indicates that it is prototype firmware.

Front Panel Access: System, Show System

Instrument State Query

```
*LRN?
```

This command is not implemented. Other commands are available for returning the `*LRN` data . Use `*IDN?` to return the instrument model number, serial number, and firmware version. Use the `*SAV/*RCL` commands to save and then return the instrument state information.

Operation Complete

```
*OPC
```

*OPC?

Sets bit 0 in the standard event status register to “1” when pending operations have finished. It does not hold off subsequent operations.

The *OPC? query stops new commands from being processed until the current processing is complete. Then it returns a “1”, and the program continues. This query can be used to synchronize events of other instruments on the external bus.

The instrument does not wait for completion of *all* processes for these commands. The processes that are monitored are identified in the STATus:OPERation register. These include:

Process	STATus:OPER Register Bit	Byte Value
Calibrating	0	1
Sweeping	3	8
MEASuring (not in all modes)	4	16
Waiting for trigger	5	32

For example, if you want to verify the completion of both calibration and waiting for trigger set :STAT:OPER:ENAB 33 and monitor any changes.

Key Type: There is no equivalent front-panel key.

Query Instrument Options

*OPT?

This command is not implemented. However the information is available remotely by using SCPI commands. See :SYSTem:OPTions? in “Show System" on page 494.

Power-On Status Clear

*PSC

*PSC?

Sets the state of the power-on status clear flag. This command allows you to specify if the service request enable register and the event status enable register should be cleared at power up.

The query returns the contents of the power-on status clear flag.

Key Type: There is no equivalent front-panel key.

Recall

```
*RCL <register>
```

Recalls the instrument state from the specified instrument memory register.

If the state being loaded has a newer firmware revision than the revision of the instrument, no state is recalled and an error is reported.

If the state being loaded has an equal firmware revision than the revision of the instrument, the state will be loaded.

If the state being loaded has an older firmware revision than the revision of the instrument, the instrument will only load the parts of the state that apply to the older revision.

Key Type: There is no equivalent front-panel key.

Range: Registers are an integer, 0 to 127

Remarks: See also commands `:MMEMory:LOAD:STATe` and `:MMEMory:STORe:STATe`.

Example: *RCL 12

Front Panel Access: File, Recall State

Reset

```
*RST
```

Presets the instrument to a factory defined condition that is appropriate for remote programming operation. In Spectrum Analysis Mode `*RST` is equivalent to performing the commands:

- `:SYSTem:PRESet`, with preset type set to MODE.
- `*CLS` which clears the STATus bits and error queue.

`*RST` does not change the mode and *only* resets the parameters for the current mode.

The `:SYSTem:PRESet` command is equivalent to the front panel Preset key.

Save

```
*SAV <register>
```

Saves the instrument state to the specified instrument memory register.

Key Type: There is no equivalent front-panel key.

Range: Registers are an integer, 0 to 127

Remarks: See also commands `:MMEMory:LOAD:STATe` and `:MMEMory:STORe:STATe`

Example:

*SAV 12

Front Panel Access: File, Save, State

Service Request Enable

`*SRE <integer>`

`*SRE?`

Sets the value of the service request enable register.

The query returns the value of the register.

Key Type: There is no equivalent front-panel key.

Range: Integer, 0 to 255

Example: *SRE 22

Read Status Byte Query

`*STB?`

Returns the value of the status byte register without erasing its contents.

Key Type: There is no equivalent front-panel key.

Remarks: See `*CLS`

Trigger

`*TRG`

Triggers the instrument. Use the `:TRIGger[:SEQuence]:SOURce` command to select the trigger source.

If you have selected a one-button measurement and it has been paused (`INITiate:PAUSe`), or the `CONFigure:<meas>` command was used, this command causes the system to exit this "waiting" state and go to the "initiated" state. The trigger system is initiated and completes one full trigger cycle. It returns to the "waiting" state on completion of the trigger cycle. See the "Measure (Spectrum Analysis Mode)" on page 233 for more information about controlling the measurement process.

The instrument must be in the single measurement mode. If `INIT:CONT ON`, then the command is ignored. Depending upon the measurement and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle.

Key Type: There is no equivalent front-panel key.

Remarks: See also the `:INITiate:IMMediate` command

Front Panel Access: Restart

Self Test Query

`*TST?`

NO tests are performed. *TST? always returns 0.

Key Type:

There is no equivalent front-panel key.

Wait-to-Continue

`*WAI`

Causes the instrument to wait until all pending commands/processes are completed before executing any additional commands. There is no query form for the command.

The instrument does not wait for completion of all processes. The processes that are monitored are identified in the *OPC? command description.

Key Type: There is no equivalent front-panel key.

Example:

```
INIT:CONT OFF; INIT;*WAI
```

STATus Subsystem

The STATus subsystem controls the SCPI-defined instrument-status reporting structures. Each status register has a set of five commands used for querying or masking that particular register.

Numeric values for bit patterns can be entered using decimal or hexadecimal representations. (that is, 0 to 32767 is equivalent to #H0 to #H7FFF) See "SCPI Language Basics" on page 582 about using bit patterns for variable parameters.

Operation Register

Operation Condition Query

```
:STATus:OPERation:CONDition?
```

Returns the decimal value of the sum of the bits in the Status Operation Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Operation Enable

```
:STATus:OPERation:ENABle <integer>
```

```
:STATus:OPERation:ENABle?
```

Determines which bits in the Operation Event register will set the Operation Status Summary bit (bit 7) in the Status Byte Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

The preset condition is to have all bits in this enable register set to 0. To have any Operation Events reported to the Status Byte Register, one or more bits need to be set to 1.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Operation Event Query

```
:STATus:OPERation[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Operation Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Operation Negative Transition

```
:STATus:OPERation:NTRansition <integer>
```

```
:STATus:OPERation:NTRansition?
```

Determines which bits in the Operation Condition register will set the corresponding bit in the Operation Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Operation Positive Transition

```
:STATus:OPERation:PTRansition <integer>
```

```
:STATus:OPERation:PTRansition?
```

Determines which bits in the Operation Condition register will set the corresponding bit in the Operation Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Preset the Status Byte

```
:STATus:PRESet
```

Sets bits in most of the enable and transition registers to their default state. It presets all the Transition Filters, Enable Registers, and the Error/Event Queue Enable. It has no effect on Event Registers, Error/Event QUEue, IEEE 488.2 ESE, and SRE Registers as described in IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols and Common Commands for Use with ANSI/IEEE Std 488.1-1987*. New York, NY, 1992.

Key Type: There is no equivalent front-panel key.

Questionable Register

Questionable Condition

```
:STATus:QUEStionable:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Enable

```
:STATus:QUEStionable:ENABle <number>
```

```
:STATus:QUEStionable:ENABle?
```

Determines which bits in the Questionable Event register will set the Questionable Status Summary bit (bit3) in the Status Byte Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

NOTE

The preset condition is all bits in this enable register set to 0. To have any Questionable Events reported to the Status Byte Register, one or more bits need to be set to 1. The Status Byte Event Register should be queried after each measurement to check the Questionable Status Summary (bit 3). If it is equal to 1, a condition during the test may have made the test results invalid. If it is equal to 0, this indicates that no hardware problem or measurement problem was detected by the N8201A.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Event Query

```
:STATus:QUEStionable[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Negative Transition

```
:STATus:QUEStionable:NTRansition <number>
```

```
:STATus:QUEStionable:NTRansition?
```

Determines which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Positive Transition

```
:STATus:QUEStionable:PTRansition <number>
```

```
:STATus:QUEStionable:PTRansition?
```

Determines which bits in the Questionable Condition register will set the corresponding bit in the Questionable Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Calibration Register

Questionable Calibration Condition

```
:STATus:QUEStionable:CALibration:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Calibration Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Calibration Enable

```
:STATus:QUEStionable:CALibration:ENABle <number>
```

```
:STATus:QUEStionable:CALibration:ENABle?
```

Determines which bits in the Questionable Calibration Condition Register will set bits in the Questionable Calibration Event register, which also sets the Calibration Summary bit (bit 8) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Example `STAT:QUES:CAL:ENABLE 16384` could be used if you have turned off the automatic alignment and you want to query whether an alignment is needed.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Calibration Event Query

```
:STATus:QUEStionable:CALibration[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Calibration Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Calibration Negative Transition

```
:STATus:QUEStionable:CALibration:NTRansition <number>
```

```
:STATus:QUEStionable:CALibration:NTRansition?
```

Determines which bits in the Questionable Calibration Condition register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Calibration Positive Transition

```
:STATus:QUEStionable:CALibration:PTRansition <number>
```

```
:STATus:QUEStionable:CALibration:PTRansition?
```

Determines which bits in the Questionable Calibration Condition register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Calibration Extended Needed Register

Questionable Calibration Extended Needed Condition

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed
:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Calibration Extended Needed Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Calibration Extended Needed Enable

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABle
<number>
```

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed:ENABle?
```

Determines which bits in the Questionable Calibration Extended Needed Enable Register will set bits in the Questionable Calibration Event register, which also sets the Calibration Summary bit (bit 8) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Example `STAT:QUES:CAL:EXT:NEED:ENABLE 16384` could be used if you have turned off the automatic alignment and you want to query whether an alignment is needed.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Calibration Extended Needed Event Query

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Calibration Extended Needed Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Calibration Extended Needed Negative Transition

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed:
NTRansition <number>
```

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed:
NTRansition?
```

Determines which bits in the Questionable Calibration Extended Needed Negative Transition register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Calibration Extended Needed Positive Transition

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed:
PTRansition <number>
```

```
:STATus:QUEStionable:CALibration:EXTended:NEEDed:
PTRansition?
```

Determines which bits in the Questionable Calibration Extended Needed Positive Transition register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Calibration Extended Failure Register

Questionable Calibration Extended Failure Condition

```
:STATus:QUEStionable:CALibration:EXTended:FAILure:
CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Calibration Extended Failure Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Calibration Extended Failure Enable

```
:STATus:QUEStionable:CALibration:EXTended:FAILure:ENABle
<number>
```

```
:STATus:QUEStionable:CALibration:EXTended:FAILure:ENABle?
```

Determines which bits in the Questionable Calibration Extended Failure Enable Register will set bits in the Questionable Calibration Event register, which also sets the Calibration Summary bit (bit 8) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Example `STAT:QUES:CAL:EXT:FAIL:ENABLE 16384` could be used if you have turned off the automatic alignment and you want to query whether an alignment is needed.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Calibration Extended Failure Event Query

```
:STATus:QUEStionable:CALibration:EXTended:FAILure[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Calibration Extended Failure Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Calibration Extended Failure Negative Transition

```
:STATus:QUEStionable:CALibration:EXTended:FAILure:
NTRansition <number>
```

```
:STATus:QUEStionable:CALibration:EXTended:FAILure:
NTRansition?
```

Determines which bits in the Questionable Calibration Extended Failure Negative Transition register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Calibration Extended Failure Positive Transition

```
:STATus:QUEStionable:CALibration:EXTended:FAILure:
PTRansition <number>
```

```
:STATus:QUEStionable:CALibration:EXTended:FAILure:
PTRansition?
```

Determines which bits in the Questionable Calibration Extended Failure register will set the corresponding bit in the Questionable Calibration Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Frequency Register

Questionable Frequency Condition

```
:STATus:QUEStionable:FREQuency:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Frequency Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Frequency Enable

```
:STATus:QUEStionable:FREQuency:ENABle <number>
```

```
:STATus:QUEStionable:FREQuency:ENABle?
```

Determines which bits in the Questionable Frequency Condition Register will set bits in the Questionable Frequency Event register, which also sets the Frequency Summary bit (bit 5) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Frequency Event Query

```
:STATus:QUEStionable:FREQuency[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Frequency Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Frequency Negative Transition

```
:STATus:QUEStionable:FREQuency:NTRansition <number>
```

```
:STATus:QUEStionable:FREQuency:NTRansition?
```

Determines which bits in the Questionable Frequency Condition register will set the corresponding bit in the Questionable Frequency Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Frequency Positive Transition

```
:STATus:QUEStionable:FREQuency:PTRansition <number>
```

```
:STATus:QUEStionable:FREQuency:PTRansition?
```

Determines which bits in the Questionable Frequency Condition register will set the corresponding bit in the Questionable Frequency Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Integrity Register

Questionable Integrity Condition

```
:STATus:QUEStionable:INTegrity:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Integrity Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Integrity Enable

```
:STATus:QUEStionable:INTegrity:ENABle <number>
```

```
:STATus:QUEStionable:INTegrity:ENABle?
```

Determines which bits in the Questionable Integrity Condition Register will set bits in the Questionable Integrity Event register, which also sets the Integrity Summary bit (bit 9) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Integrity Event Query

```
:STATus:QUEStionable:INTegrity[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Integrity Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Integrity Negative Transition

```
:STATus:QUEStionable:INTegrity:NTRansition <number>
```

```
:STATus:QUEStionable:INTegrity:NTRansition?
```

Determines which bits in the Questionable Integrity Condition register will set the corresponding bit in the Questionable Integrity Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Integrity Positive Transition

```
:STATus:QUEStionable:INTegrity:PTRansition <number>
```

```
:STATus:QUEStionable:INTegrity:PTRansition?
```

Determines which bits in the Questionable Integrity Condition register will set the corresponding bit in the Questionable Integrity Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Integrity Signal Register

Questionable Integrity Signal Condition

```
:STATus:QUEStionable:INTegrity:SIGNal:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Integrity Signal Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Integrity Signal Enable

```
:STATus:QUEStionable:INTegrity:SIGNal:ENABle <number>
```

```
:STATus:QUEStionable:INTegrity:SIGNal:ENABle?
```

Determines which bits in the Questionable Integrity Signal Condition Register will set bits in the Questionable Integrity Signal Event register, which also sets the Integrity Summary bit (bit 9) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Integrity Signal Event Query

```
:STATus:QUEStionable:INTegrity:SIGNal[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Integrity Signal Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Integrity Signal Negative Transition

```
:STATus:QUEStionable:INTegrity:SIGNal:NTRansition <number>
```

```
:STATus:QUEStionable:INTegrity:SIGNal:NTRansition?
```

Determines which bits in the Questionable Integrity Signal Condition register will set the corresponding bit in the Questionable Integrity Signal Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Integrity Signal Positive Transition

```
:STATus:QUEStionable:INTegrity:SIGNal:PTRansition <number>
```

```
:STATus:QUEStionable:INTegrity:SIGNal:PTRansition?
```

Determines which bits in the Questionable Integrity Signal Condition register will set the corresponding bit in the Questionable Integrity Signal Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Integrity Uncalibrated Register

Questionable Integrity Uncalibrated Condition

```
:STATus:QUEStionable:INTegrity:UNCalibrated:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Integrity Uncalibrated Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Integrity Uncalibrated Enable

```
:STATus:QUEStionable:INTegrity:UNCalibrated:ENABle
```

```
:STATus:QUEStionable:INTegrity:UNCalibrated:ENABle?
```

Determines which bits in the Questionable Integrity Uncalibrated Condition Register will set bits in the Questionable Integrity Uncalibrated Event register, which also sets the Data Uncalibrated Summary bit (bit 3) in the Questionable Integrity Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Integrity Uncalibrated Event Query

```
:STATus:QUEStionable:INTegrity:UNCalibrated[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Integrity Uncalibrated Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Integrity Uncalibrated Negative Transition

```
:STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition
<number>
```

```
:STATus:QUEStionable:INTegrity:UNCalibrated:NTRansition?
```

Determines which bits in the Questionable Integrity Uncalibrated Condition register will set the corresponding bit in the Questionable Integrity Uncalibrated Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Integrity Uncalibrated Positive Transition

```
:STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition
<number>
```

```
:STATus:QUEStionable:INTegrity:UNCalibrated:PTRansition?
```

Determines which bits in the Questionable Integrity Uncalibrated Condition register will set the corresponding bit in the Questionable Integrity Uncalibrated Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Power Register

Questionable Power Condition

```
:STATus:QUEStionable:POWer:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Power Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Power Enable

```
:STATus:QUEStionable:POWer:ENABle <number>
```

```
:STATus:QUEStionable:POWer:ENABle?
```

Determines which bits in the Questionable Power Condition Register will set bits in the Questionable Power Event register, which also sets the Power Summary bit (bit 3) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Power Event Query

```
:STATus:QUEStionable:POWer[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Power Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Power Negative Transition

```
:STATus:QUEStionable:POWer:NTRansition <number>
```

```
:STATus:QUEStionable:POWer:NTRansition?
```

Determines which bits in the Questionable Power Condition register will set the corresponding bit in the Questionable Power Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Power Positive Transition

```
:STATus:QUEStionable:POWer:PTRansition <number>
```

```
:STATus:QUEStionable:POWer:PTRansition?>
```

Determines which bits in the Questionable Power Condition register will set the corresponding bit in the Questionable Power Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Temperature Register

Questionable Temperature Condition

```
:STATus:QUEStionable:TEMPerature:CONDition?
```

Returns the decimal value of the sum of the bits in the Questionable Temperature Condition register.

The data in this register is continuously updated and reflects the current conditions.

Key Type: There is no equivalent front-panel key.

Questionable Temperature Enable

```
:STATus:QUEStionable:TEMPerature:ENABle <number>
```

```
:STATus:QUEStionable:TEMPerature:ENABle?
```

Determines which bits in the Questionable Temperature Condition Register will set bits in the Questionable Temperature Event register, which also sets the Temperature Summary bit (bit 4) in the Questionable Register. The variable <number> is the sum of the decimal values of the bits you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

Questionable Temperature Event Query

```
:STATus:QUEStionable:TEMPerature[:EVENt]?
```

Returns the decimal value of the sum of the bits in the Questionable Temperature Event register.

The register requires that the associated PTR or NTR filters be set before a condition register bit can set a bit in the event register.

The data in this register is latched until it is queried. Once queried, the register is cleared.

Key Type: There is no equivalent front-panel key.

Questionable Temperature Negative Transition

```
:STATus:QUEStionable:TEMPerature:NTRansition <number>
```

```
:STATus:QUEStionable:TEMPerature:NTRansition?
```

Determines which bits in the Questionable Temperature Condition register will set the corresponding bit in the Questionable Temperature Event register when the condition register bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 0

Range: 0 to 32767

Questionable Temperature Positive Transition

```
:STATus:QUEStionable:TEMPerature:PTRansition <number>
```

```
:STATus:QUEStionable:TEMPerature:PTRansition?
```

Determines which bits in the Questionable Temperature Condition register will set the corresponding bit in the Questionable Temperature Event register when the condition register bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that you want to enable.

Key Type: There is no equivalent front-panel key.

Factory Preset: 32767 (all 1's)

Range: 0 to 32767

28 Programming Fundamentals

This chapter contains the following sections.

"SCPI Language Basics" on page 582

"Improving Measurement Speed" on page 589

"Programming Command Compatibility Across Modes" on page 594

"Using the LAN to Control the Instrument" on page 597

"Programming in C Using the VTL" on page 616

SCPI Language Basics

This section is not intended to teach you everything about the SCPI (Standard Commands for Programmable Instruments) programming language. The SCPI Consortium or IEEE can provide that level of detailed information.

Topics covered in this chapter include:

- "Command Keywords and Syntax" on page 582.
- "Creating Valid Commands" on page 582.
- "Special Characters in Commands" on page 583.
- "Parameters in Commands" on page 584.
- "Putting Multiple Commands on the Same Line" on page 586.

For more information refer to:

IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation.* New York, NY, 1998.

IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols and Comment Commands for Use with ANSI/IEEE Std488.1-1987*. New York, NY, 1998.

Command Keywords and Syntax

A typical command is made up of keywords set off by colons. The keywords are followed by parameters that can be followed by optional units.

Example: `SENSe:FREQuency:STARt 1.5 MHZ`

The instrument does not distinguish between upper and lower case letters. In the documentation, upper case letters indicate the short form of the keyword. The lower case letters, indicate the long form of the keyword. Either form may be used in the command.

Example: `Sens:Freq:Star 1.5 mhz`

is the same as `SENSE:FREQ:start 1.5 MHz`

The command `SENS:FREQU:STAR` is not valid because `FREQU` is neither the short, nor the long form of the command. Only the short and long forms of the keywords are allowed in valid commands.

Creating Valid Commands

Commands are not case sensitive and there are often many different ways of writing a particular command. These are examples of valid commands for a given command syntax:

Command Syntax	Sample Valid Commands
[SENSe:]BANDwidth[:RESolution] <freq>	The following sample commands are all identical. They will all cause the same result. • Sense:Band:Res 1700 • BANDWIDTH:RESOLUTION 1.7e3 • sens:band 1.7KHZ • SENS:band 1.7E3Hz • band 1.7kHz • bandwidth:RES 1.7e3Hz
MEASure:SPECtrum[n]?	• MEAS:SPEC? • Meas:spec? • meas:spec3? The number 3 in the last meas example causes it to return different results then the commands above it. See the command description for more information.
[:SENSe]:DETector[:FUNCtion] NEGative | POSitive | SAMPle	• DET:FUNC neg • Detector:Func Pos
INITiate:CONTinuous ON | OFF | 1 | 0	The sample commands below are identical. • INIT:CONT ON • init:continuous 1

Special Characters in Commands

Special Character	Meaning	Example
| |	A vertical stroke between parameters indicates alternative choices. The effect of the command is different depending on which parameter is selected.	Command: `TRIGger:SOURce EXTernal | INTernal | LINE` The choices are external, internal, and line. Ex: `TRIG:SOURCE INT` is one possible command choice.
| |	A vertical stroke between keywords indicates identical effects exist for both keywords. The command functions the same for either keyword. Only one of these keywords is used at a time.	Command: `SENSe:BANDwidth | BWIDth:OFFSet` Two identical commands are: Ex1: • `SENSE:BWIDTH:OFFSET` Ex2: • SENSE:BAND:OFFSET

Special Character	Meaning	Example
[ ]	Keywords in square brackets are optional when composing the command. These implied keywords will be executed even if they are omitted.	Command: `[SENSe:]BANDwidth[:RESolution]:AUTO` The following commands are all valid and have identical effects: • Ex1: `bandwidth:auto` • Ex2: `band:resolution:auto` • Ex3: `sense:bandwidth:auto`
< >	Angle brackets around a word, or words, indicates they are not to be used literally in the command. They represent the needed item.	Command: `SENS:FREQ <freq>` In this command example the word <freq> should be replaced by an actual frequency. • Ex: `SENS:FREQ 9.7MHz`.

{ }	Parameters in braces can optionally be used in the command either not at all, once, or several times.	Command:
		`MEASure:BW <freq>{,level}`
		A valid command is:
		`meas:BW 6 MHz, 3dB, 60dB`

Parameters in Commands

There are four basic types of parameters: booleans, keywords, variables and arbitrary block program data.

OFF | ON | 0 | 1 (Boolean) This is a two state boolean-type parameter. The numeric value 0 is equivalent to OFF. Any numeric value other than 0 is equivalent to ON. The numeric values of 0 or 1 are commonly used in the command instead of OFF or ON. Queries of the parameter always return a numeric value of 0 or 1.

keyword The keywords that are allowed for a particular command are defined in the command syntax description.

Units Numeric variables may include units. The valid units for a command depend on the variable type being used. See the following variable descriptions. The indicated default units will be used if no units are sent. Units can follow the numerical value with, or without, a space.

Variable A variable can be entered in exponential format as well as standard numeric format. The appropriate range of the variable and its optional units are defined in the command description.

The following keywords may also be used in commands, but not all commands allow keyword variables.

- DEFault - resets the parameter to its default value.
- UP - increments the parameter.

- DOWN - decrements the parameter.
- MINimum - sets the parameter to the smallest possible value.
- MAXimum - sets the parameter to the largest possible value.

The numeric value for the function's MINimum, MAXimum, or DEFault can be queried by adding the keyword to the command in its query form. The keyword must be entered following the question mark.

Example query: `SENSE:FREQ:CENTER? MAX`

Variable Parameters

<integer> Is an integer value with no units.

<real> Is a floating point number with no units.

<freq><bandwidth> Is a positive rational number followed by optional units. The default unit is Hertz. Acceptable units include: Hz, kHz, MHz, GHz.

<time><seconds> Is a rational number followed by optional units. The default units are seconds. Acceptable units include: ks, s, ms, µs, ns.

<voltage> Is a rational number followed by optional units. The default units are Volts. Acceptable units include: V, mV, µV, nV

<current> Is a rational number followed by optional units. The default units are Amperes. Acceptable units include: A, mA, µA, nA.

<power> Is a rational number followed by optional units. The default units are W. Acceptable units include: mAW, kW, W, mW, µW, nW, pW.

<ampl> Is a rational number followed by optional units. The default units are dBm. Acceptable units include: dBm, dBmV, dBuV.

<rel_power><rel_ampl> Is a positive rational number followed by optional units. The default units are dB. Acceptable units include: dB.

<percent> Is a rational number between 0 and 100. You can either use no units or use PCT.

<angle><degrees> Is a rational number followed by optional units. The default units are degrees. Acceptable units include: DEG, RAD.

<string> Is a series of alpha numeric characters.

<bit_pattern> Specifies a series of bits rather than a numeric value. The bit series is the binary representation of a numeric value. There are no units.

Bit patterns are most often specified as hexadecimal numbers, though octal, binary or decimal numbers may also be used. In the SCPI language these numbers are specified as:

- Hexadecimal, #Hdddd or #hdddd where ‘d’ represents a hexadecimal digit 0 to 9 and ‘a’ to ‘f’. So #h14 can be used instead of the decimal number 20.
- Octal, #Oddddddor #odddddd where ‘d’ represents an octal digit 0 to 7. So #o24 can be used instead of the decimal number 20.
- Binary, #Bddddddddddddddddd or #bddddddddddddddddd where ‘d’ represents a 1 or 0. So #b10100 can be used instead of the decimal number 20.

Block Program Data

Some parameters consist of a block of data. There are a few standard types of block data. Arbitrary blocks of program data can also be used.

<trace> Is an array of rational numbers corresponding to displayed trace data. See FORMat:DATA for information about available data formats.

A SCPI command often refers to a block of current trace data with a variable name such as: Trace1, TRACE2, or trace3, depending on which trace is being accessed.

<arbitrary block data> Consists of a block of data bytes. The first information sent in the block is an ASCII header beginning with #. The block is terminated with a semi-colon. The header can be used to determine how many bytes are in the data block. There are no units. (You will not get block data if your data type is ASCII, using `FORMat:DATA ASCII` command. Your data will be comma separated ASCII values.

Block data example: suppose the header is #512320.

- The first digit in the header (5) tells you how many additional digits/bytes there are in the header.
- The 12320 means 12 thousand, 3 hundred, 20 data bytes follow the header.
- Divide this number of bytes by your current data format (bytes/data point), either 8 (for real,64), or 4 (for real,32). For this example, if you’re using real64 then there are 1540 points in the block.

Putting Multiple Commands on the Same Line

Multiple commands can be written on the same line, reducing your code space requirement. To do this:

- Commands must be separated with a semicolon (;).
- If the commands are in different subsystems, the key word for the new subsystem must be preceded by a colon (:).
- If the commands are in the same subsystem, the full hierarchy of the command key words need not be included. The second command can start at the same key word level as the command that was just executed.

SCPI Termination and Separator Syntax

All binary trace and response data is terminated with <NL><END>, as defined in Section 8.5 of IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols and Common Commands for Use with ANSI/IEEE Std 488.1-1987*. New York, NY, 1992. (Although one intent of SCPI is to be interface independent, <END> is only defined for IEEE 488 operation.)

The following are some examples of good and bad commands. The examples are created from a theoretical instrument with the simple set of commands indicated below:

```
[:SENSe]
        :POWer
                [:RF]
                :ATTenuation 40dB

:TRIGger
        [:SEQuence]
        :EXTernal [1]
                :SLOPe
                        POSitive

[:SENSe]
        :FREQuency
                :STARt
        :POWer
        [:RF]
                :MIXer
                        :RANGe
                       [:UPPer]
```

Bad Command	Good Command
PWR:ATT 40dB	POW:ATT 40dB
The short form of `POWER` is `POW`, not `PWR`.	
FREQ:STAR 30MHz;MIX:RANG -20dBm	FREQ:STAR 30MHz;POW:MIX:RANG -20dBm
The `MIX:RANG` command is in the same `:SENSE` subsystem as `FREQ`, but executing the `FREQ` command puts you back at the `SENSE` level. You must specify `POW` to get to the `MIX:RANG` command.	
FREQ:STAR 30MHz;POW:MIX RANG -20dBm	FREQ:STAR 30MHz;POW:MIX:RANG -20dBm
`MIX` and `RANG` require a colon to separate them.	
POW:ATT 40dB;TRIG:FREQ:STAR 2.3GHz	:POW:ATT 40dB;:FREQ:STAR 2.3GHz
`:FREQ:STAR` is in the `:SENSE` subsystem, not the `:TRIGGER` subsystem.	
POW:ATT?:FREQ:STAR?	:POW:ATT?;:FREQ:STAR?

Bad Command	Good Command
: POW and FREQ are within the same : SENSE subsystem, but they are two separate commands, so they should be separated with a semicolon, not a colon.	
POW:ATT -5dB;:FREQ:STAR 10MHz	:POW:ATT 5dB;:FREQ:STAR 10MHz
Attenuation cannot be a negative value.	

Improving Measurement Speed

There are a number of things you can do in your programs to make them run faster:

"Turn off the display updates" on page 589.

"Use binary data format instead of ASCII" on page 589.

"Put ADC Ranging in Bypass for FFT Measurements for N8201A" on page 590.

"Minimize DUT/instrument setup changes" on page 590

There are additional things you can do to run faster if you are using a measurement personality option (that is, instrument Modes other than the standard Spectrum Analysis Mode). These considerations only apply to specific option modes.

"Using an Option Mode: Avoid automatic attenuator setting" on page 591.

"Using an Option Mode: Optimize your GSM output RF spectrum switching measurement" on page 591.

"Using an Option Mode: When making power measurements on multiple bursts or slots, use CALCulate:DATA<n>:COMPress?" on page 592.

Turn off the display updates

`:DISPlay:ENABle OFF` turns off the display. That is, the data may still be visible, but it will no longer be updated. Updating the display slows down the measurement. For remote testing, since the computer is processing the data rather than a person, there is no need to display the data on the Spectrum Analyzer GUI display.

Use binary data format instead of ASCII

The ASCII data format is the instrument default since it is easier for people to understand and is required by SCPI for *RST. However, data input/output is faster using the binary formats.

`:FORMat:DATA REAL,64` selects the 64-bit binary data format for all your numerical data queries. You may need to swap the byte order if you are using a PC rather than UNIX. `NORMal` is the default byte order. Use `:FORMat:BORDer SWAP` to change the byte order so that the least significant byte is sent first. (Real,32 which is smaller and somewhat faster, should only be used if you do not need full resolution for your data. Some frequency data may require full 64 bit resolution.)

When using the binary format, data is sent in a block of bytes with an ASCII header. A data query would return the block of data in the following format: `#DNNN<nnn binary data bytes>`

To parse the data:

- Read two characters (#D), where D tells you how many N characters follow the D character.

- Read D characters, the resulting integer specifies the number of data bytes sent.
- Read the bytes into a real array.

For example, suppose the header is #512320.

- The first character/digit in the header (5) tells you how many additional digits there are in the header.
- The 12320 means 12 thousand, 3 hundred, 20 data bytes follow the header.
- Divide this number of bytes by your current data format (bytes/data point), 8 for real,64. For this example, there are 1540 data points in the block of data.

Avoid unnecessary use of *RST

Remember that while `*RST` does not change the current Mode, it presets all the measurements and settings to their factory defaults. This forces you to reset your N8201A's measurement settings even if they use similar mode setup or measurement settings. See "Minimize DUT/instrument setup changes" on page 590. (Also note that *RST may put the instrument in single measurement/sweep for some modes.)

Put ADC Ranging in Bypass for FFT Measurements for N8201A

Setting ADC ranging to the Bypass mode can speed FFT measurements up by 10% to 50%. (Use `ADC:RANG NONE`) Bypass allows triggered FFT measurements to occur at the trigger time instead of following an autoranging time, so it can improve measurement speed. It does, however, add additional noise degrading your signal to noise level, so it should be used carefully.

Minimize DUT/instrument setup changes

- Some instrument setup parameters are common to multiple measurements. You should look at your measurement process with an eye toward minimizing setup changes. If your test process involves nested loops, make sure that the inner-most loop is the fastest. Also, check if the loops could be nested in a different order to reduce the number of parameter changes as you step through the test.
- Are you are using the measurements under the MEASURE key? Remember that if you have already set your Meas Setup parameters for a measurement, and you want to make another one of these measurements later, use READ:<meas>?. The MEASure:<meas>?. command resets all the settings to the defaults, while READ changes back to that measurement without changing the setup parameters from the previous use.
- Are you are using the Measurements under the MEASURE key? Remember that *Mode Setup* parameters remain constant across all the measurements in that mode (e.g. center/channel frequency, amplitude, radio standard, input selection, trigger setup). You don't have to reinitialize them each time you change to a different measurement.

Using an Option Mode: Avoid automatic attenuator setting

The internal process for automatically setting the value of the attenuator requires measuring an initial burst to identify the proper attenuator setting before the next burst can be measured properly. If you know the amount of attenuation or the signal level needed for your measurement, just set it.

Note that spurious types of measurements must be done with the attenuator set to automatic (for measurements like: output RF spectrum, transmit spurs, adjacent channel power, spectrum emission mask). These types of measurements start by tuning to the signal, then they tune away from it and must be able to reset the attenuation value as needed.

Using an Option Mode: Optimize your GSM output RF spectrum switching measurement

For ORFS (switching), setting the break frequency to zero (0) puts the N8201A in a measurement setup where it can use a direct time measurement algorithm, instead of an FFT-based algorithm. This non-FFT approach is faster. (However, remember that your break frequency for ORFS (modulation) measurements must be >400 kHz for valid measurements, so you will need to change the break frequency if you are making both types of measurements.)

Using an Option Mode: Avoid using RFBurst trigger for single burst signals

RFBurst triggering works best when measuring signals with repetitive bursts. For a nonrepetitive or single burst signals, use the IF (video) trigger or external trigger, depending on what you have available.

RFBurst triggering depends on its establishment of a valid triggering reference level, based on previous bursts. If you only have a single burst, the peak detection nature of this triggering function, may result in the trigger being done at the wrong level/point generating incorrect data, or it may not trigger at all.

Are you making a single burst measurement?

To get consistent triggering and good data for this type of measurement application, you need to synchronize the triggering of the DUT with the N8201A. You should use the N8201A's internal status system for this.

The first step in this process is to initialize the status register mask to look for the "waiting for trigger" condition (bit 5). Use `:STATus:OPERation:ENABle 32`

Then, in the measurement loop:

1 `:STATus:OPERation:EVENt?` This query of the operation event register is to clear the current register contents.

2 `:READ:PVT?` initiates a measurement (in this example, for GSM power versus time) using the previous setup. The measurement will then be waiting for the trigger.

Make sure the attenuation is set manually. Do NOT use automatic attenuation as this requires an additional burst to determine the proper attenuation level before the measurement can be made.

3 Create a small loop that will serial poll the instrument for a status byte value of binary 128. Then wait 1 msec (100 ms if the display is left on/enabled) before checking again, to keep the bus traffic down. These two commands are repeated until the condition is set, so we know that the trigger is armed and ready.

4 Trigger your DUT to send the burst.

5 Return the measurement data to your computer.

This process cannot be done by using with the current VXI plug-n-play driver implementation. You will need to use the above SCPI commands.

Using an Option Mode: When making power measurements on multiple bursts or slots, use CALCulate:DATA<n>:COMPress?

The `CALC:DATA:COMP?` query is the fastest way to measure power data for multiple bursts/slots. There are two reasons for this: 1. it can be used to measure data across multiple, consecutive slots/frames with just one measurement, instead of a separate measurement on each slot, and 2. it can preprocess and decimate the data so that you only return the information that you need which minimizes data transfer to the computer.

For example: let's say you want to do a power measurement for a GSM base station where you generate a repeating frame with eight different power levels. You can gather all the data with a single `CALC:DATA:COMP?` acquisition, using the waveform measurement.

With CALC:DATA2:COMP? MEAN,9,197,1730 you can measure the mean power in those bursts. This single command will measure the data across all eight frames, locate the first slot/burst in each of the frames, calculate the mean power of those bursts, then return the resulting eight values.

Set up the GSM Waveform measurement:

- `:CONF:WAV?` turns on the waveform measurement
- `:WAV:BAND 300khz` sets a resolution bandwidth of 300 kHz
- `:WAV:SWE:TIME 5ms` sets a sweep time of 5 milliseconds
- `:WAV:BAND:TYPE FLAT` selects the flat filter type
- `:WAV:DEC 4;DEC:STAT ON` selects a decimation of 4 and turns on decimation. This reduces the amount of data that needs to be sent since the instrument hardware decimates (throws some away).
- `:INIT` to initiate a measurement and acquire the data
- `CALC:DATA2:COMP? MEAN,25us,526us,579.6us,8` to return the desired data

You may need to know the sample interval. In the waveform measurement it is equal to the aperture value. Query :WAVeform:APERture? to find the sample interval. (Note: the WAV:APER? command always takes decimation into account.) The sample interval (aperture value) is dependent on the settings for resolution bandwidth, filter type, and decimation. See Table 13 to see how these value relate.

The parameters for this GSM example are `MEAN,9,197,1730`.

- `MEAN` calculates the mean of the measurement points indicated.
- 9 is how many points you want to discard before you look at the data. This allows you to skip over any "unsettled" values at the beginning of the burst. You can calculate this start offset by (25µs/sample interval)
- 197 is the length of the data you want to use. This would be the portion of the burst that you want to find the mean power over. You can calculate this length by (526µs/sampleInterval).
- 1730 is how much data you have before you repeat the process. For this example it is the time between the start offset point on the burst in the first slot (first frame) to the same spot on the burst in the first slot (second frame). You can calculate this by (576.9µs*N/sampleInterval) where N is the number of data items that you want. In this case it is the number of slots in the frame, N=8.)

Table 13 GSM Parameters for 1 Slot/Frame Measurement Requirements

Resolution Bandwidth	Filter Type	Decimation	Aperture	Start	Length	Repeat
500 or 300 kHz	Flat or Gaussian	4 or 1	dependent on settings	24 µsec	526 µsec	576.9 µsec
500 kHz	Gaussian	1	0.2 µsec	124	2630	2884.6
500 kHz	Gaussian	4	0.8 µsec	31	657	721.15
500 kHz	Flat	1	0.4 µsec	61	1315	1442.3
500 kHz	Flat	4	1.6 µsec	15	329	360.575
300 kHz	Gaussian	1	0.2667 µsec	90	1972	2163.1
300 kHz	Gaussian	4	1.07 µsec	22	492	539.16
300 kHz	Flat	1	0.6667 µsec	36	789	865.31
300 kHz	Flat	4	2.667 µsec	9	197	216.33

Programming Command Compatibility Across Modes

Command Subsystem

When you select different modes you get different sets of available programming commands. That is, *only* the commands that are appropriate for the current mode are available. Also, some commands have the same syntax in different modes but have different ranges or settings that are only appropriate to the current mode.

The following table shows which command subsystems are the same across different modes. If there is no "X" by a particular subsystem, then the set of available commands is different in those modes. Command ranges or defaults may also be different. Refer to the programming command descriptions in the documentation for each mode for details.

Command Subsystem	Same command set is available in Basic mode.	Same command set is available: SA mode compared with the application modes: Phase Noise, Noise Figure, TD-SCDMA
IEEE common commands	X	X
ABORt	X	X
CALCulate		
CALibration	X	X
CONFigure		
COUPle	not available in these application modes	not available in these application modes
DISPlay		
FETCh		
FORMat		X
HCOPy	X	X
INITiate		
INPut	not available in these application modes	X
MEASure		
MEMory	X	X
MMEMory	X	X
MMEMory:STORe:TRACe	not available in these application modes	X
READ		

Command Subsystem	Same command set is available in Basic mode.	Same command set is available: SA mode compared with the application modes: Phase Noise, Noise Figure, TD-SCDMA
[SENSe]		
[SENSe:]CHANnel		
[SENSe:]CORRection		
[SENSe:]FEED		
[SENSe:]FREQuency:CENTer	X	
[SENSe:]FREQuency: <other subsystems>	not available in these application modes	not available in these application modes
[SENSe:]<measurement>		
[SENSe:]POWer		
[SENSe:]RADio		
[SENSe:]SYNC		
STATus	X	X
SYSTem	X	X
TRACe	not available in these application modes	X
TRIGger		
UNIT	X	X

Specific Command Differences

Some programming commands operate differently depending on which Mode the N8201A is set to.

Command	Spectrum Analysis, Phase Noise and Noise Figure Mode	Basic, cdmaOne, cdma2000, 1xEV-DO, W-CDMA, GSM, EDGE, NADC, PDC Modes
CONFigure: <measurement>	Accesses the measurement and sets the instrument settings to the defaults. Averaging is turned on and set to 10. The instrument is put in single measurement mode. It does not initiate a measurement. Use INIT:IMM to make one measurement.	Accesses the measurement and sets the instrument settings to the defaults. If you were already in single measurement mode, it takes one measurement and then waits. If you were in continuous measurement mode it continues to measure.

Command	Spectrum Analysis, Phase Noise and Noise Figure Mode	Basic, cdmaOne, cdma2000, 1xEV-DO, W-CDMA, GSM, EDGE, NADC, PDC Modes
*ESE default	Default is 255 which means that every error/status bit change that has occurred will be returned with a *ESR? query. You must set the value of *ESE to choose only the bits/status that you want returned.	Default is 0 which means that none of the error/status bit changes that have occurred will be returned with a *ESR? query. You must set the value of *ESE to choose the bits/status that you want returned.
TRIGger commands	For these modes, only one trigger source can be selected and it will be common across the modes. Also, only one value can be set for the trigger delay, level, or polarity.	For these modes, a unique trigger source can be selected for each mode. Also, each trigger source can have unique settings for the its delay, level, and polarity.
Saving and recalling traces	Traces can only be saved when in the Spectrum Analysis mode (MMEM:STOR:TRAC). This is because the instrument state must be saved along with the trace data and the state data varies depending on the number of modes currently available in the instrument.	

Using the LAN to Control the Instrument

Remember that in any type of programming using LAN you should avoid constantly opening and closing connections. This uses up processing resources, adds to your system overhead, and can cause problems with asynchronous implementation of successive commands. When you are sending the instrument multiple commands: open the connection, send all the commands, and close the connection.

- "Using Telnet to Send Commands" on page 598.
- "Using SICL LAN to Control the Instrument" on page 604.
- "Using HP/Agilent VEE Over Socket LAN" on page 609.

The Standard UNIX FTP Command:

Synopsis `ftp [-g] [-i] [-n] [-v] [server-host] [-B DataSocketBufferSize]`

Description The `ftp` command is used to transfer files using the File Transfer Protocol. `ftp` transfers files over a network connection between a local machine and the remote `server-host`.

Options and Parameters When ftp is invoked with a server-host specified, a connection is opened immediately. Otherwise, ftp waits for user commands.

The following options are supported:

-g disables expansion of shell metacharacters in file and directory names

-i disables prompts during multiple-file operations

-n disables automatic log-in

-v enables verbose output

-B specifies a new `DataSocketBufferSize`

server-host the name or address of the remote host.

This table lists the available user commands.

Table 14 `ftp` Commands

Command	Description
ascii	Sets the file transfer type to ASCII.
binary	Sets the file transfer type to binary.

Table 14 `ftp` Commands

Command	Description
bye	Closes the connection to the host and exits ftp.
cd *remote_directory*	Sets the working directory on the host to *remote_directory*.
delete *remote_file*	Deletes *remote_file* or empty *remote_directory*.
dir [*remote_directory*]	Lists the contents of the specified *remote_directory.* If *remote_directory* is unspecified, the contents of the current remote directory are listed.
get *remote_file* [*local_file*]	Copies *remote_file* to *local_file*. If *local_file* is unspecified, ftp uses the *remote_file* name as the *local_file* name.
help	Provides a list of ftp commands.
help *command*	Provides a brief description of *command*.
image	Sets the file transfer type to binary.
lcd [*local_directory*]	Sets the local working directory to *local_directory*.
ls [*remote_directory*]	Lists the contents of the specified *remote_directory.* If the *remote_directory* is unspecified, the contents of the current remote directory are listed.
mget *remote_file [local_file]*	Copy *remote_file* to the local system. If *local_file* is unspecified, ftp uses the *remote_file* name as the *local_file* name.
mput *local_file [remote_file]*	Copies *local_file* to remote file. If *remote_file* is unspecified, ftp uses the *local_file* name as the *remote_file* name.
put *local_file* [*remote_file*]	Copies *local_file* to *remote file*. If *remote_file* is unspecified, ftp uses the *local_file* name as the *remote_file* name.
quit	Closes the connection to the host and exits ftp.

Using Telnet to Send Commands

Using telnet to send commands to your instrument works in a similar way to communicating over GPIB. You establish a connection with the instrument, and then send or receive information using SCPI commands.

If you need to control the bus using “device clear” or SRQ’s, you can use SICL LAN. SICL LAN provides control of your instrument via IEEE 488.2 GPIB over the LAN. See “Using SICL LAN to Control the Instrument" on page 604 in this chapter.

STATus bits that are already set when the socket connection is made cannot be read. Only status bit changes that occur after the socket connection is made will returned when the status register is queried.

On unix or PC:

The syntax of the telnet command is:

```
telnet <IP address> <5023>
```

The initial telnet connection message will be displayed and then a SCPI> prompt. At the SCPI prompt, simply enter the desired SCPI commands.

On a PC (with telnet gui that has host/port setting menu):

You would type at the dos prompt

```
telnet
```

NOTE

Early versions of Windows XP Telnet will initially only send a LF, not a CRLF. So the telnet port 5023 does not work. You can manually correct this situation by sending the escape sequence and then a CRLF. After connecting to the instrument, type in the telnet window:

- Crtl-] (press the control and] keys simultaneously)
- set crlf <enter key>
- <enter key>

You should now see the SCPI> prompt and you can continue working.

The Windows XP Service Pack 2 fixes this problem. You can get Service Pack 2 from the Microsoft Windows update website.

Unix Telnet Example:

To connect to the instrument with host name `aaa` and port number `5023`, enter the following command:

```
telnet aaa 5023
```

When you connect to the instrument, it will display a welcome message and a command prompt. The instrument is now ready to accept your SCPI commands. As you type SCPI commands, query results appear on the next line. At any time, you can send a <device clear> by pressing cntrl-c on your keyboard. When you are done, break the telnet connection using your escape character, and type `quit`.

When the instrument responds with the welcome message and the SCPI prompt, you can immediately enter programming (SCPI) commands.

Typical commands might be:

```
CALC:MARK:MODE POS
CALC:MARK:MAX
CALC:MARK:X?
```

The small program above sets the instrument to measure a signal amplitude by placing a marker on the maximum point of the trace, and then querying the instrument for the amplitude of the marker.

You need to press Enter after typing in each command. After pressing Enter on the last line in the example above, the instrument returns the amplitude level of the marker to your computer and displays it on the next line. For example, after typing `(for N8201A) CALC:MARK:MAX?` and pressing Enter, the computer could display:

```
+2.50000000000E+010
```

When you are done, close the telnet connection. Enter the escape character to get the telnet prompt. The escape character (Ctrl and "]" in this example) does not print.

At the telnet prompt, type `quit` or `close`.

The telnet connection closes and you see your regular prompt.

```
Connection closed.
```

The following example shows a terminal screen using the proceeding example commands.

Telnet Example:

```
Welcome to at42

Agilent Technologies,N8201A,US41220095,A.02.04 20010921
10:52:07


SCPI>calc:mark:mode pos

SCPI>calc:mark:max

SCPI>calc:mark:x?

+2.5000000000000000E+010

SCPI>
```

If your telnet connection is in a mode called “line-by-line,” there is no local echo. This means you will not be able to see the characters you are typing on your computer's display until *after* you press the **Enter** key.

To remedy this, you need to change your telnet connection to “character-by-character” mode. This can be accomplished in most systems by escaping out of telnet to the `telnet>` prompt and then typing `mode char`. If this does not work, consult your telnet program's documentation for how to change to “character-by-character” mode.

The Standard UNIX TELNET Command:

Synopsis `telnet [host [port]]`

Description The `telnet` command is used to communicate with another host using the TELNET protocol. When `telnet` is invoked with `host` or `port` arguments, a connection is opened to `host`, and input is sent from the user to `host`.

Options and Parameters `telnet` operates in line-by-line mode or in character-at-a-time mode. In line-by-line mode, typed text is first echoed on the screen. When the line is completed by pressing **Enter**, the text line is then sent to `host`. In character-at-a-time mode, text is echoed to the screen and sent to `host` as it is typed.

In some cases, if your telnet connection is in "line-by-line" mode, there is no local echo. This means you will not be able to see the characters you are typing on your computer's display until *after* you press **Enter**.

To remedy this, you need to change your telnet connection to "character-by-character" mode. This can be accomplished in most systems by escaping out of telnet to the `telnet>` prompt and then typing `mode char`. Consult your telnet program's documentation for how to change to "character-by-character" mode.

Socket LAN Clear Device Example:

This example puts the `N8201A` into Device Clear Active state. The first parameter is the hostname of the `N8201A`. The second parameter is the port number assigned to the control channel for the raw SCPI channel. This number is obtained with the `SYST:COMM:LAN:SCPI:SOCK:CONT?` command.

```
using System;

using System.Text;

using System.Threading;

using System.Collections;

using System.Net.Sockets;


namespace ConsoleApplication1

{

/// <summary>

/// This program demonstrates sending a device clear to the N8201A over raw sockets

/// </summary>

class Class1

{

// This method puts the N8201A into Device Clear Active State. The first parameter is the

// hostname of the N8201A. The second parameter is the port number assigned to the control

// channel for the raw SCPI channel. This number is obtained with the

// SYST:COMM:LAN:SCPI:SOCK:CONT? command.
```

```
static void doDcas(string host,
int port)
{
// First open the control port

TcpClient dcasPort = new TcpClient();
dcasPort.Connect(host,port);

NetworkStream dcasStream = dcasPort.GetStream();

// The control port accepts one command only. When you send DCL\n to the control
// port, a device clear will automatically happen.

dcasStream.Write(Encoding.UTF8.GetBytes("DCL\n"),0,4);
}

/// <summary>
/// This program demonstrates how to do a device clear over the raw socket port. The
N8201A
/// must be running revision A.09.00 firmware or later.
/// </summary>
[STAThread]
static void Main(string[] args)
{
TcpClient N8201A = new TcpClient();

// First open the N8201A. Replace the string "N8201A" with the hostname assigned to
your
// N8201A.
```

```
N8201A.Connect("N8201A",5025);
NetworkStream ioStream = N8201A.GetStream();

// Next, send the N8201A the query to obtain the port number assigned to this SCPI
// channel's control port. We must do this every time we create a new TcpClient to
// the N8201A.

Byte[] sendBytes = Encoding.UTF8.GetBytes ("SYST:COMM:LAN:SCPI:SOCK:CONT?\n");
ioStream.Write (sendBytes, 0, sendBytes.Length);

byte[] reply = new byte[80];
ioStream.Read(reply,0,80);
string returndata = Encoding.UTF8.GetString(reply);
int port = Convert.ToInt32(returndata);

// We now have the port number and can send the N8201A a device clear. As an example,
// we put the N8201A into single sweep and start a 100 second sweep. Next we sleep for
// five seconds and then send the device clear. One the front panel of the N8201A, you
// will notice that the 100 second sweep starts and then, five seconds later,
// restarts again. The restart is the result of the device clear we sent.

byte[] cmd = Encoding.UTF8.GetBytes("INIT:CONT  OFF;:SWE:TIME 100;:INIT:IMM\n");
ioStream.Write(cmd,0,cmd.Length);

// sleep so the device clear become obvious

Thread.Sleep(5000);
string host = "N8201A";  // once again replace N8201A with your hostname
doDcas(host,port);    // now do the device clear
```

```
}
}
}
```

Troubleshooting help:

You can verify that you can open a socket connection to your instrument by using telnet:

telnet <IP address> 5025

Characters typed from your keyboard will not be echoed from the instrument and the SCPI prompt will not be given. However, you will be able to send commands and query the instrument. For example, you can type `*idn?` and the instrument identification string will be returned.

Using SICL LAN to Control the Instrument

SICL LAN is a LAN protocol using the Standard Instrument Control Library (SICL). It provides control of your instrument over the LAN, using a variety of computing platforms, I/O interfaces, and operating systems. With SICL LAN, you control your remote instrument over the LAN with the same methods you use for a local instrument connected directly to the controller with the GPIB. More information about SICL LAN can be found in the *HP Standard Instrument Control Library* user's guide for HP-UX, part number E2091-90004.

Your instrument implements a SICL LAN *server*. To control the instrument, you need a SICL LAN *client* application running on a computer or workstation that is connected to the instrument over a LAN. Typical applications implementing a SICL LAN client include

- HP/Agilent VEE
- HP/Agilent BASIC
- National Instrument's LabView with HP/Agilent VISA/SICL client drivers

The SICL LAN protocol is Agilent's implementation of the VXI-11 Instrument Protocol, defined by the VXIbus Consortium working group.

Older versions of National Instruments' VISA does not support the VXI-11 Instrument Protocol. Contact National Instruments for their latest version.

SICL LAN can be used with Windows 95, Windows 98, Windows NT, and HP-UX.

Your instrument has a SICL LAN server to emulate GPIB over LAN, but it cannot be used to control other connected GPIB instruments.

Collecting SICL LAN Set-up Information

Before you set up your instrument as a SICL LAN server, you need some information about your instrument. The "value" of the following parameters is used to set up your VISA/SICL LAN client application:

Emulated GPIB Name The GPIB name is the name given to a device used to communicate with the instrument. Your instrument is shipped with `gpib7` as its GPIB name. The GPIB name is the same as the remote SICL address.

Emulated GPIB Logical Unit The logical unit number is a unique integer assigned to the device to be controlled using SICL LAN. Your instrument is shipped with the logical unit number set to `8`.

This can't be change, but you don't care. Numbers 0 through 30, excluding 21, are valid logical unit numbers for your instrument. Logical unit number 21 is used for the instrument's internal emulation mode. (If you are using Agilent VEE and SICL LAN, the logical unit number is limited to the range of 0-8.)

Emulated GPIB Address The emulated GPIB address (bus address) is assigned to the device to be controlled using SICL LAN. The instrument is shipped with the emulated GPIB address set to `18`. The emulated GPIB address, for `N8201A`, will always be 18, regardless of what you set the GPIB address to.

The SICL LAN server uses the GPIB name, GPIB logical unit number, and GPIB address configuration on the SICL LAN client to communicate with the client. You must match these parameters *exactly* (including case) when you set up the SICL LAN client and server.

Configuring Your Instrument as a SICL LAN Server

After you have collected the required information from the SICL LAN client, perform the following steps to set up your instrument as a SICL LAN server:

Identify the GPIB name.

1 Press System, Config I/O, SICL Server, Emulated GPIB Name, and notice that it is gpib7.

2 Notice that the Emulated GPIB Logical Unit is set to 8.

3 Notice that the Emulated GPIB Address is set to 18.

Configuring a PC as a SICL LAN Client

The descriptions here are based on Agilent's VISA revision G.02.02, model number 2094G. A copy of Agilent VISA instrument io libraries can be found on Agilent's website:

http://www.agilent.com/find/iolib

see also:

http://www.agilent.com/find/vee

The VISA User's Guide information on LAN programming may also be useful, see:

ftp://ftp.agilent.com/pub/mpusup/pc/binfiles/iop/index.html

The following assumes a LAN connection between your computer and your instrument. This will not work for the GPIB to LAN gateway.

1 Install VISA revision G.02.02 or higher.

2 Run I/O configuration.

3 Select LAN Client from the available interface types.

4 Press **Configure**.

5 Enter an interface name, such as lan1.

6 Enter a logical unit number, such as 7.

7 Select **Okay**.

8 Select **VISA LAN Client** from the available interface types.

9 Press **Configure**.

10 Enter a VISA interface name, such as GPIB1.

11 Enter the host name or IP address of your instrument in the host name field, such as aaa.companyname.com or 137.12.255.255.

NOTE Changing the host name in your instrument does not change your LAN system representation of the host name. You must work through your local system administrator to change the host name on your LAN system and then change it to match in your instrument.

12 Enter a Remote SICL address, such as GPIB7.

13 Set the LAN interface to match the defined LAN client.

14 Select **OK**.

15 Close I/O Configuration by selecting **OK**.

Controlling Your Instrument with SICL LAN and HP/Agilent VEE

Before you can use SICL LAN with VEE, you need to set up VISA/SICL LAN I/O drivers for use with your VEE application. Consult your VEE documentation for information how to do this.

NOTE If you are using Agilent VEE and SICL LAN, the logical unit number is limited to the range of 0-8.

The logical unit number is the same as the interface select code (ISC). VEE reserves ISC values 9-18, and does not allow you to use them for SICL/LAN communications with your instrument. VEE also does not allow any ISC values higher than 18.

After you have the VISA/SICL LAN I/O drivers installed, perform the steps below to set up VEE to control your instrument:

1 On your computer or workstation, select `I/O|Instrument Manager`.

2 Add a new GPIB device with an address of 7XX, where XX is the GPIB device address from your instrument.

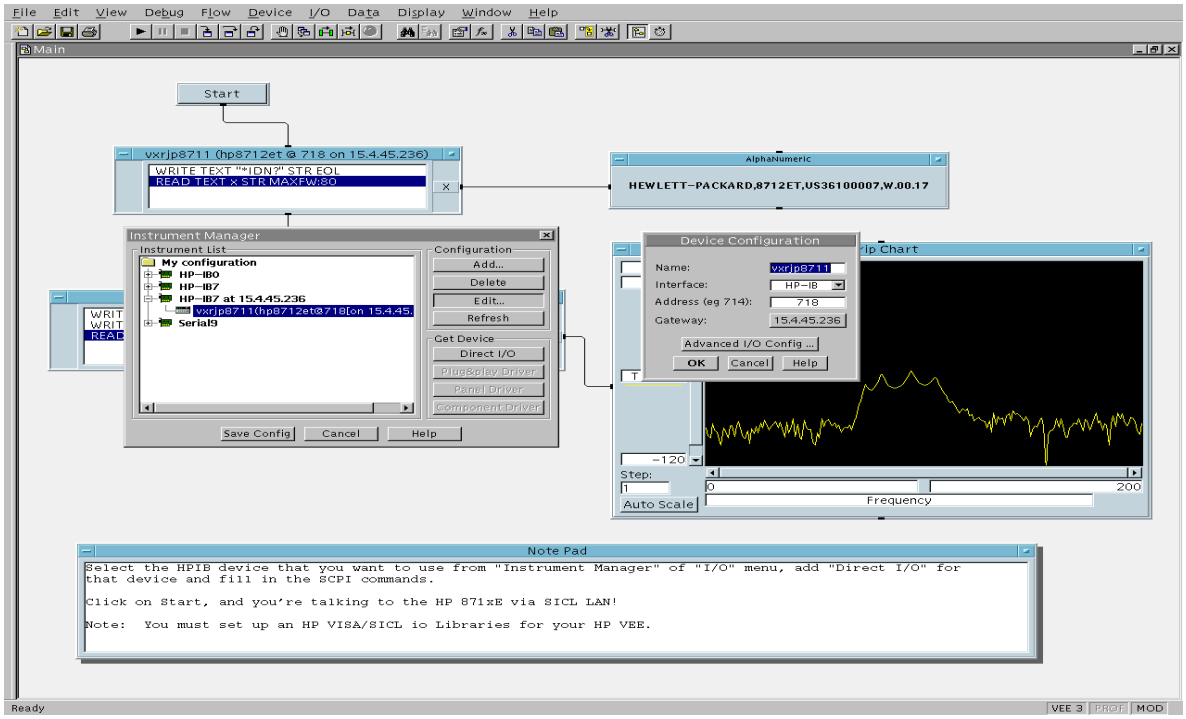


Figure 11 Adding Your Instrument as a VEE Device

To send SCPI commands to the instrument, select I/O|Instrument Manager, and the GPIB device just added. Select Direct I/O. You can now type SCPI commands in the command window, and they are sent over the LAN to your instrument.

Controlling Your Instrument with SICL LAN and Agilent BASIC for Windows

Before you can use Agilent BASIC for Windows with SICL LAN, you need to set up VISA/SICL LAN I/O drivers for use with your BASIC applications. Consult your BASIC documentation for information how to do this.

To set up SICL LAN for BASIC, add the following statement to your AUTOST program (all on a single line):

```
LOAD BIN "GPIBS;DEV lan[N8201A IP address]:GPIB name TIME 30
ISC 7"
```

Replace `N8201A IP address` with the IP address of your instrument, `GPIP name` with the GPIB name given to your instrument, and `7` with the logical unit number.

For example, the following LOAD statement should be added to your AUTOST program for the parameters listed below:

instrument IP address

191.108.344.225

instrument GPIB name

inst0

logical unit number

7

timeout value (seconds)

30

LOAD statement (all on a single line)

```
LOAD BIN "GPIBS;DEV lan[191.108.344.225]:inst0 TIME 30
ISC 7"
```

Consult your BASIC documentation to learn how to load the SICL driver for BASIC.

After the SICL driver is loaded, you control your instrument using commands such as the following:

```
OUTPUT 718; "*IDN?"
ENTER 718; S$
```

where 18 is the device address for the instrument.

See the BASIC example program in this chapter for more information.

Controlling Your Instrument with SICL LAN and BASIC for UNIX (Rocky Mountain BASIC)

Before you can use Rocky Mountain Basic (HPRMB) with SICL LAN, you will need to set up the SICL LAN I/O drivers for HPRMB. Consult your system administrator for details.

Create a .rmbrc file in your root directory of your UNIX workstation with the following entries:

```
SELECTIVE_OPEN=ON
Interface 8= "lan[N8201A IP address]:GPIB name";NORMAL
```

Replace N8201A IP address with the IP address of your instrument, and GPIB name with the GPIB name given to your instrument. Also replace the "8" of Interface 8 with the logical unit number. Consult your HPRMB documentation for the exact syntax.

After your SICL driver is configured correctly on your UNIX workstation, you control your instrument using commands such as the following:

```
OUTPUT 818; "*IDN?"
ENTER 818; S$
```

where 18 is the device address for the instrument.

Using HP/Agilent VEE Over Socket LAN

(There is a VEE example program provided on the documentation CD-ROM.)

(There is a LabView example program provided on the documentation CD-ROM.)

To control your instrument via socket LAN using VEE, click on the VEE menu titled "I/O." Then select “To/From Socket” and position the I/O object box on the screen. Fill in the following fields:

```
Connect Port:    5025
Host Name:       <your_hostname>
Timeout:         15
```

For faster troubleshooting, you may want to set the timeout to a smaller number. If the host name you enter does not work, try using the IP address of your instrument (example: `191.108.43.5`). Using the IP address rather than the hostname may also be faster. See Figure 12 for an example of an VEE screen.

NOTE Changing the host name in the instrument does not change your LAN system’s representation of the host name. You must work through your local system administrator to change the host name on your LAN system.

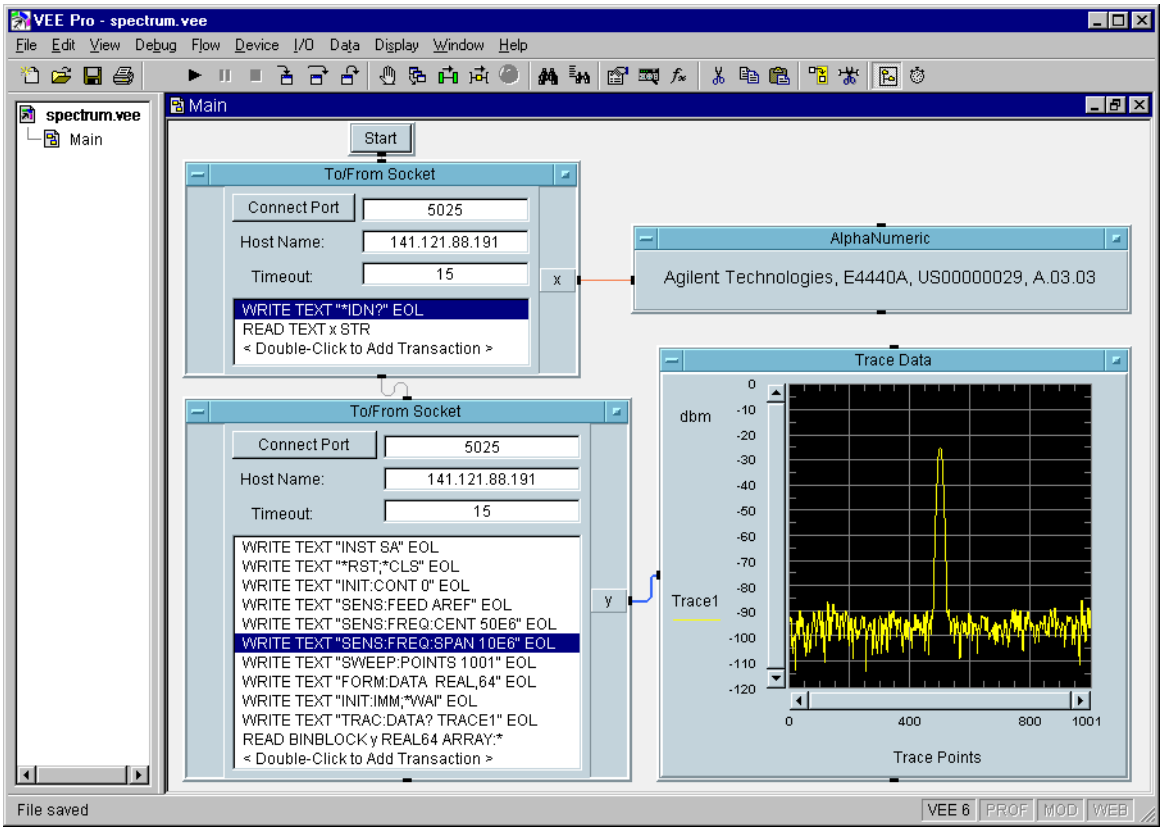


Figure 12 Sample VEE Screen

Common Problems After a Connection is Made

This section describes common problems you may encounter when using the instrument on a LAN. It assumes you have been able to connect to the instrument in the past. If this is not so, refer to the previous sections first.

Pressing Preset does not affect LAN settings, but pressing **System, Restore Sys Defaults** will reset to the original factory defaults. You will then have to reset the instrument IP address and other LAN settings in System, Config I/O.

Remember that in any type of programming using LAN you should avoid constantly opening and closing connections. This uses up processing resources, adds to your system overhead, and can cause problems with asynchronous implementation of successive commands. When you are sending the instrument multiple commands: open the connection, send all the commands, and close the connection.

Cannot connect to the N8201A

- If you suspect a bad LAN connection between your computer and instrument, you can verify the network connection by using the ping command described later in this chapter or another similar echo request utility.

- If a bad connection is revealed, try the following solutions:
  - Make sure the instrument is turned on.
  - Check the physical connection to the LAN.
  - Make sure the internet (IP) Address of the instrument is set up correctly with the webpage. Refer to the user's guide for more information.
  - When connecting to your instrument over a closed network (directly through a hub or crossover cable) it may help to set the instrument to its default settings for subnet mask and gateway. (subnet mask: 255.255.0.0, gateway 0.0.0.0)
  - If the instrument and the computer are on different networks or subnets, make sure the gateway address and subnet mask values are set correctly.

Cannot access the file system via ftp

- If you get a "connection refused" message, try the following solutions:
  - If the power to the instrument was just turned on, make sure that you wait about 25 seconds before attempting the connection.
- If you get a "connection timed out" message:
  - Verify the LAN connection between your computer and the instrument. Refer to "Cannot connect to the N8201A" on page 610.

Cannot telnet to the command parser port

- For a "connection refused" message:
  - Check the telnet port number from the front panel keys.
- For a "connection timed out" or "no response from host" message:
  - Verify the LAN connection between your computer and the instrument. Refer to "If you cannot connect to the instrument" earlier in this section.
- For a "connection refused" or "no response from host" message:
  - If the instrument was just turned on, make sure that you wait about 25 seconds before attempting the connection.

An "operation timed-out" message

- Check the LAN connection between the computer and the instrument. Refer to "Cannot connect to the N8201A" on page 610.
- Increase the file time-out value on your PC or workstation.

Cannot access internal web pages or import graphic images when using a point-to-point connection

- Disable the use of proxy servers. You may have to specify this in a number of locations, depending on the operating system and software you are using.

- Disable the use of cached copies of web pages to ensure that you always get a new copy of the instrument's screen image.

If all else fails

- Contact your network administrator.
- If you still cannot solve the problem, contact an Agilent Service Center for repair information.

Pinging the Instrument from a Computer or Workstation

Verify the communications link between the computer and the instrument remote file server using the ping utility.

From a UNIX workstation, type:

```
ping hostname 64 10
```

where 64 is the packet size, and 10 is the number of packets transmitted.

From a DOS or Windows environment, type:

```
ping hostname 10
```

where 10 is the number of echo requests.

Normal Response for UNIX

A normal response to the ping will be a total of 9, 10, or possibly 11 packets received with a minimal average round-trip time. The minimal average will be different from network to network. LAN traffic will cause the round-trip time to vary widely.

Because the number of packets received depends on your network traffic and integrity, the normal number might be different for your network.

Normal Response for DOS or Windows

A normal response to the ping will be a total of 9, 10, or possibly 11 packets received if 10 echo requests were specified.

Because the number of packets received depends on your network traffic and integrity, the normal number might be different for your network.

Error Messages

If error messages appear, then check the command syntax before continuing with the troubleshooting. If the syntax is correct, then resolve the error messages using your network documentation, or by consulting your network administrator.

No Response No packets received indicates no response from a ping.

If there is no response, try typing in the IP address with the ping command, instead of using the host name. Check that the typed address matches the IP address assigned in the System, Config I/O menu, then check the other addresses in the menu.

Check that the host name and IP address are correctly entered in the node names database.

If you are using a UNIX environment, ping each node along the route between your workstation and the instrument, starting with the your workstation. Ping each gateway, then attempt a ping of the remote file server.

If the instrument still does not respond to ping, then you should suspect a hardware problem with the instrument.

Intermittent Response If you received 1 to 8 packets back, there is probably a problem with the network. Because the number of packets received depends on your network traffic and integrity, the number might be different for your network.

Use a LAN analyzer or LAN management software to monitor activity and determine where bottlenecks or other problems are occurring. The instrument will still function, but communications over the LAN will be slower.

On a single-client/single-server network, the most likely cause of intermittent response to an echo request is a hardware problem with the LAN module installed in the PC, the cable, or the instrument.

The Standard UNIX PING Command Synopsis `ping [-r] [-v] [-o] host [packetsize] [count]`

Description The `ping` command sends an echo request packet to the `host` once per second. Each echo response packet that is returned is listed on the screen, along with the round-trip time of the echo request and echo response.

Options and Parameters -r

Bypasses the routing tables, and sends the request directly to the host.

-v Reports all packets that are received, including the response packets.

-o Requests information about the network paths taken by the requests and responses.

host The host name or IP address.

packetsize The size of each packet (8 bytes - 4096 bytes).

count The number of packets to send before ending ping (1-(2^{31}-1)). If `count` is not specified, `ping` sends packets until interrupted.

EIA/TIA 568B Wiring Information

Table 15 Straight-Through Cable (Unshielded-twisted-pair (UTP) cable with RJ-45 connectors)

Standard, Straight-Through Wiring (each end)			
Signal Name	**RJ-45 Pin #**	**Wire Color**	**Pair #**
RX+	1	white/orange	2
RX-	2	orange	
TX+	3	white/green	3
TX-	6	green	
Not Used	4	blue	1
	5	white/blue	
	7	white/brown	4
	8	brown	

Table 16 Cross-Over Cable (Unshielded-twisted-pair (UTP) cable with RJ-45 connectors)

Cross-Over Wiring*			
Connector A		**Connector B**	
Signal Name	**RJ-45 Pin #**	**RJ-45 Pin #**	**Signal Name**
RX+	1	3	TX+
RX-	2	6	TX-
TX+	3	1	RX+
TX-	6	2	RX-
Not Used	4	4	Not Used
	5	5	
	7	7	
	8	8	

* Either end of this cable can be used at the instrument or LAN device. The connector names are a convention useful during cable construction only.

This cable can be used to cascade hubs or to make point-to-point connections without a LAN hub.

A convenient way to make a cross-over adapter is to use two RJ-45 *jacks* wired according to Table 16, above. Standard straight-through patch cables can then be used from the instrument to the adapter, and from the adapter to other LAN devices. If you use a special-purpose adapter, you will avoid having a cross-over cable mistaken for a standard, straight-through patch cable.

Some commercially-available cross-over cables do not implement the cross-over wiring required for your instrument. Refer to Table 16, above, and verify all connections before using cables not made by Agilent Technologies.

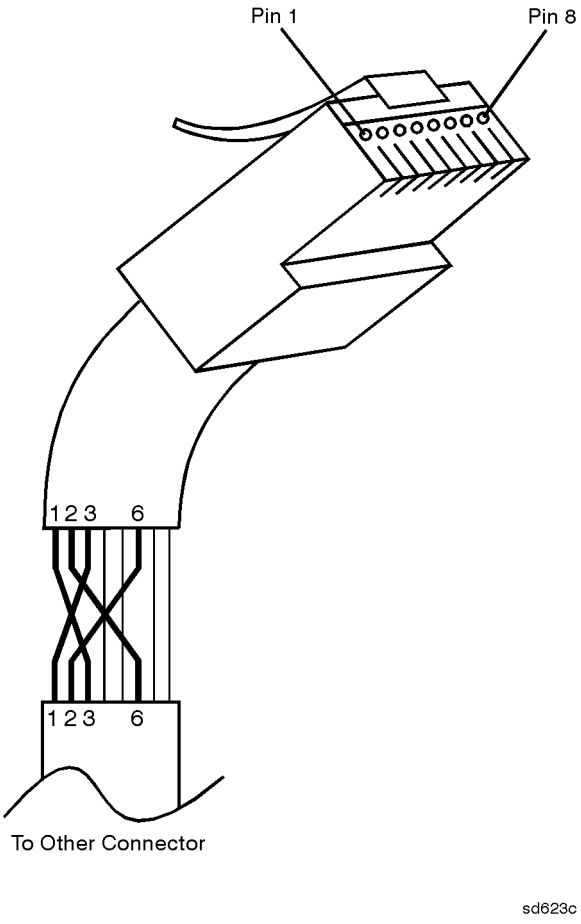


Figure 13 Cross-Over Patch Cable Wiring (cross-over end)

Programming in C Using the VTL

The programming examples that are provided are written using the C programming language and the Agilent VTL (VISA transition library). This section includes some basic information about programming in the C language. Note that some of this information may not be relevant to your particular application. (For example, if you are not using VXI instruments, the VXI references will not be relevant).

Refer to your C programming language documentation for more details. (This information is taken from the manual "VISA Transition Library", part number E2090-90026.) The following topics are included:

- "Typical Example Program Contents" on page 616.
- "Linking to VTL Libraries" on page 617.
- "Compiling and Linking a VTL Program" on page 617.
- "Example Program" on page 618.
- "Including the VISA Declarations File" on page 619.
- "Opening a Session" on page 619.
- "Device Sessions" on page 620.
- "Addressing a Session" on page 621.
- "Closing a Session" on page 622.

Typical Example Program Contents

The following is a summary of the VTL function calls used in the example programs.

visa.h This file is included at the beginning of the file to provide the function prototypes and constants defined by VTL.

ViSession The `ViSession` is a VTL data type. Each object that will establish a communication channel must be defined as `ViSession`.

viOpenDefaultRM You must first open a session with the default resource manager with the `viOpenDefaultRM` function. This function will initialize the default resource manager and return a pointer to that resource manager session.

viOpen This function establishes a communication channel with the device specified. A session identifier that can be used with other VTL functions is returned. This call must be made for each device you will be using.

viPrintf viScanf These are the VTL formatted I/O functions that are patterned after those used in the C programming language. The `viPrintf` call sends the IEEE 488.2 `*RST` command to the instrument and puts it in a known state. The `viPrintf` call is used again to query for the device identification (`*IDN?`). The `viScanf` call is then used to read the results.

viClose This function must be used to close each session. When you close a device session, all data structures that had been allocated for the session will be de-allocated. When you close the default manager session, all sessions opened using the default manager session will be closed.

Linking to VTL Libraries

Your application must link to one of the VTL import libraries:

32-bit Version:

`C:\VXIPNP\WIN95\LIB\MSC\VISA32.LIB` for Microsoft compilers

`C:\VXIPNP\WIN95\LIB\BC\VISA32.LIB` for Borland compilers

16-bit Version:

`C:\VXIPNP\WIN\LIB\MSC\VISA.LIB` for Microsoft compilers

`C:\VXIPNP\WIN\LIB\BC\VISA.LIB` for Borland compilers

See the following section, "Compiling and Linking a VTL Program" on page 617 for information on how to use the VTL run-time libraries.

Compiling and Linking a VTL Program

32-bit Applications

The following is a summary of important compiler-specific considerations for several C/C++ compiler products when developing WIN32 applications.

For Microsoft Visual C++ version 2.0 compilers:

- Select `Project | Update All Dependencies` from the menu.
- Select `Project | Settings` from the menu. Click on the `C/C++` button. Select `Code Generation` from the `Use Run-Time Libraries` list box. VTL requires these definitions for WIN32. Click on `OK` to close the dialog boxes.
- Select `Project | Settings` from the menu. Click on the Link button and add `visa32.lib` to the `Object / Library Modules` list box. Optionally, you may add the library directly to your project file. Click on `OK` to close the dialog boxes.
- You may wish to add the include file and library file search paths. They are set by doing the following:

1. Select `Tools | Options` from the menu.
2. Click on the `Directories` button to set the include file path.
3. Select `Include Files` from the `Show Directories For` list box.
4. Click on the `Add` button and type in the following: `C:\VXIPNP\WIN95\INCLUDE`
5. `Select Library Files` from the `Show Directories For` list box.

6 Click on the Add button and type in the following: C:\VXIPNP\WIN95\LIB\MSC

For Borland C++ version 4.0 compilers:

- You may wish to add the include file and library file search paths. They are set under the Options | Project menu selection. Double click on Directories from the Topics list box and add the following:

```
C:\VXIPNP\WIN95\INCLUDE
C:\VXIPNP\WIN95\LIB\BC
```

16-bit Applications

The following is a summary of important compiler-specific considerations for the Windows compiler.

For Microsoft Visual C++ version 1.5:

- To set the memory model, do the following:

1 Select Options | Project.

2 Click on the Compiler button, then select Memory Model from the Category list.

3 Click on the Model list arrow to display the model options, and select Large.

4 Click on OK to close the Compiler dialog box.

- You may wish to add the include file and library file search paths. They are set under the Options | Directories menu selection:

```
C:\VXIPNP\WIN\INCLUDE
C:\VXIPNP\WIN\LIB\MSC
```

Otherwise, the library and include files should be explicitly specified in the project file.

Example Program

This example program queries a GPIB device for an identification string and prints the results. Note that you must change the address.

```
/*idn.c - program filename */

#include "visa.h"
#include <stdio.h>

void main ()
{

      /*Open session to GPIB device at address 18 */
      ViOpenDefaultRM (&defaultRM);
      ViOpen (defaultRM, GPIB0::18::INSTR", VI_NULL,
        VI_NULL, &vi);
```

```
      /*Initialize device */
      viPrintf (vi, "*RST\n");

      /*Send an *IDN? string to the device */
      printf (vi, "*IDN?\n");

      /*Read results */
      viScanf (vi, "%t", &buf);

      /*Print results */
      printf ("Instrument identification string: %s\n",
buf);

      /* Close sessions */
      viClose (vi);
      viClose (defaultRM);
}
```

Including the VISA Declarations File

For C and C++ programs, you must include the `visa.h` header file at the beginning of every file that contains VTL function calls:

```
#include "visa.h"
```

This header file contains the VISA function prototypes and the definitions for all VISA constants and error codes. The `visa.h` header file includes the `visatype.h` header file.

The `visatype.h` header file defines most of the VISA types. The VISA types are used throughout VTL to specify data types used in the functions. For example, the `viOpenDefaultRM` function requires a pointer to a parameter of type `ViSession`. If you find `ViSession` in the `visatype.h` header file, you will find that `ViSession` is eventually typed as an unsigned long.

Opening a Session

A session is a channel of communication. Sessions must first be opened on the default resource manager, and then for each device you will be using. The following is a summary of sessions that can be opened:

- A resource manager session is used to initialize the VISA system. It is a parent session that knows about all the opened sessions. A resource manager session must be opened before any other session can be opened.
- A device session is used to communicate with a device on an interface. A device session must be opened for each device you will be using. When you use a device session you can communicate without worrying about the type of interface to which it is connected. This insulation makes applications more robust and portable across interfaces. Typically a device is an instrument, but could be a computer, a plotter, or a printer.

NOTE All devices that you will be using need to be connected and in working condition prior to the first VTL function call (`viOpenDefaultRM`). The system is configured only on the *first* `viOpenDefaultRM` per process. Therefore, if `viOpenDefaultRM` is called without devices connected and then called again when devices are connected, the devices will not be recognized. You must close ALL resource manager sessions and reopen with all devices connected and in working condition.

Device Sessions

There are two parts to opening a communications session with a specific device. First you must open a session to the default resource manager with the `viOpenDefaultRM` function. The first call to this function initializes the default resource manager and returns a session to that resource manager session. You only need to open the default manager session once. However, subsequent calls to `viOpenDefaultRM` returns a session to a unique session to the same default resource manager resource.

Next, you open a session with a specific device with the `viOpen` function. This function uses the session returned from `viOpenDefaultRM` and returns its own session to identify the device session. The following shows the function syntax:

viOpenDefaultRM (*sesn*);

viOpen (*sesn*, *rsrcName*, *accessMode*, *timeout*, *vi*);

The session returned from `viOpenDefaultRM` must be used in the *sesn* parameter of the `viOpen` function. The `viOpen` function then uses that session and the device address specified in the *rsrcName* parameter to open a device session. The *vi* parameter in `viOpen` returns a session identifier that can be used with other VTL functions.

Your program may have several sessions open at the same time by creating multiple session identifiers by calling the `viOpen` function multiple times.

The following summarizes the parameters in the previous function calls:

sesn This is a session returned from the `viOpenDefaultRM` function that identifies the resource manager session.

rsrcName This is a unique symbolic name of the device (device address).

accessMode This parameter is not used for VTL. Use VI_NULL.

timeout This parameter is not used for VTL. Use VI_NULL.

vi This is a pointer to the session identifier for this particular device session. This pointer will be used to identify this device session when using other VTL functions.

The following is an example of opening sessions with a GPIB multimeter and a GPIB-VXI scanner:

```
ViSession defaultRM, dmm, scanner;
.
.
viOpenDefaultRM(&defaultRM);
viOpen (defaultRM, "GPIB0::22::INSTR", VI_NULL,
   VI_NULL, &dmm);
viOpen (defaultRM, "GPIB-VXI0::24::INSTR", VI_NULL,
   VI_NULL, &scanner);
.
.
viClose (scanner);
viClose (dmm);
viClose(defaultRM);
```

The above function first opens a session with the default resource manager. The session returned from the resource manager and a device address is then used to open a session with the GPIB device at address 22. That session will now be identified as dmm when using other VTL functions. The session returned from the resource manager is then used again with another device address to open a session with the GPIB-VXI device at primary address 9 and VXI logical address 24. That session will now be identified as scanner when using other VTL functions. See the following section for information on addressing particular devices.

Addressing a Session

As seen in the previous section, the *rsrcName* parameter in the `viOpen` function is used to identify a specific device. This parameter is made up of the VTL interface name and the device address. The interface name is determined when you run the VTL Configuration Utility. This name is usually the interface type followed by a number. The following table illustrates the format of the *rsrcName* for the different interface types

:

Interface	Syntax
VXI	VXI [*board*]::*VXI logical address*[::INSTR]
GPIB-VXI	GPIB-VXI [*board*]::*VXI logical address*[::INSTR]
GPIB	GPIB [*board*]::*primary address*[::*secondary address*][::INSTR]

The following describes the parameters used above:

board This optional parameter is used if you have more than one interface of the same type. The default value for *board* is 0.

VSI logical address This is the logical address of the VXI instrument.

primary address This is the primary address of the GPIB device.

secondary address This optional parameter is the secondary address of the GPIB device. If no secondary address is specified, none is assumed.

INSTR This is an optional parameter that indicates that you are communicating with a resource that is of type INSTR, meaning instrument.

If you want to be compatible with future releases of VTL and VISA, you must include the INSTR parameter in the syntax.

The following are examples of valid symbolic names:

XI0::24::INSTR Device at VXI logical address 24 that is of VISA type INSTR.

VXI2::128 Device at VXI logical address 128, in the third VXI system (VXI2).

GPIB-VXI0::24 A VXI device at logical address 24. This VXI device is connected via a GPIB-VXI command module.

GPIB0::7::0 A GPIB device at primary address 7 and secondary address 0 on the GPIB interface.

The following is an example of opening a device session with the GPIB device at primary address23.

```
ViSession defaultRM, vi;

.
.

viOpenDefaultRM (&defaultRM);

viOpen (defaultRM, "GPIB0::23::INSTR",
VI_NULL,VI_NULL,&vi);

.
.

viClose(vi);

viClose (defaultRM);
```

Closing a Session

The `viClose` function must be used to close each session. You can close the specific device session, which will free all data structures that had been allocated for the session. If you close the default resource manager session, all sessions opened using that resource manager will be closed.

Since system resources are also used when searching for resources (`viFindRsrc`) or waiting for events (`viWaitOnEvent`), the `viClose` function needs to be called to free up find lists and event contexts.